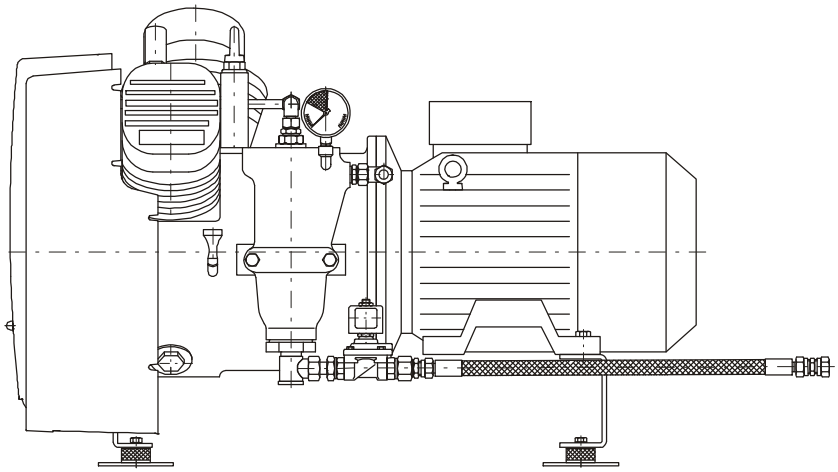
J.P. SAUER & SOHN
MASCHINENBAU GMBH



Sauer Compressor

Type: WP 33 L

Operator Manual

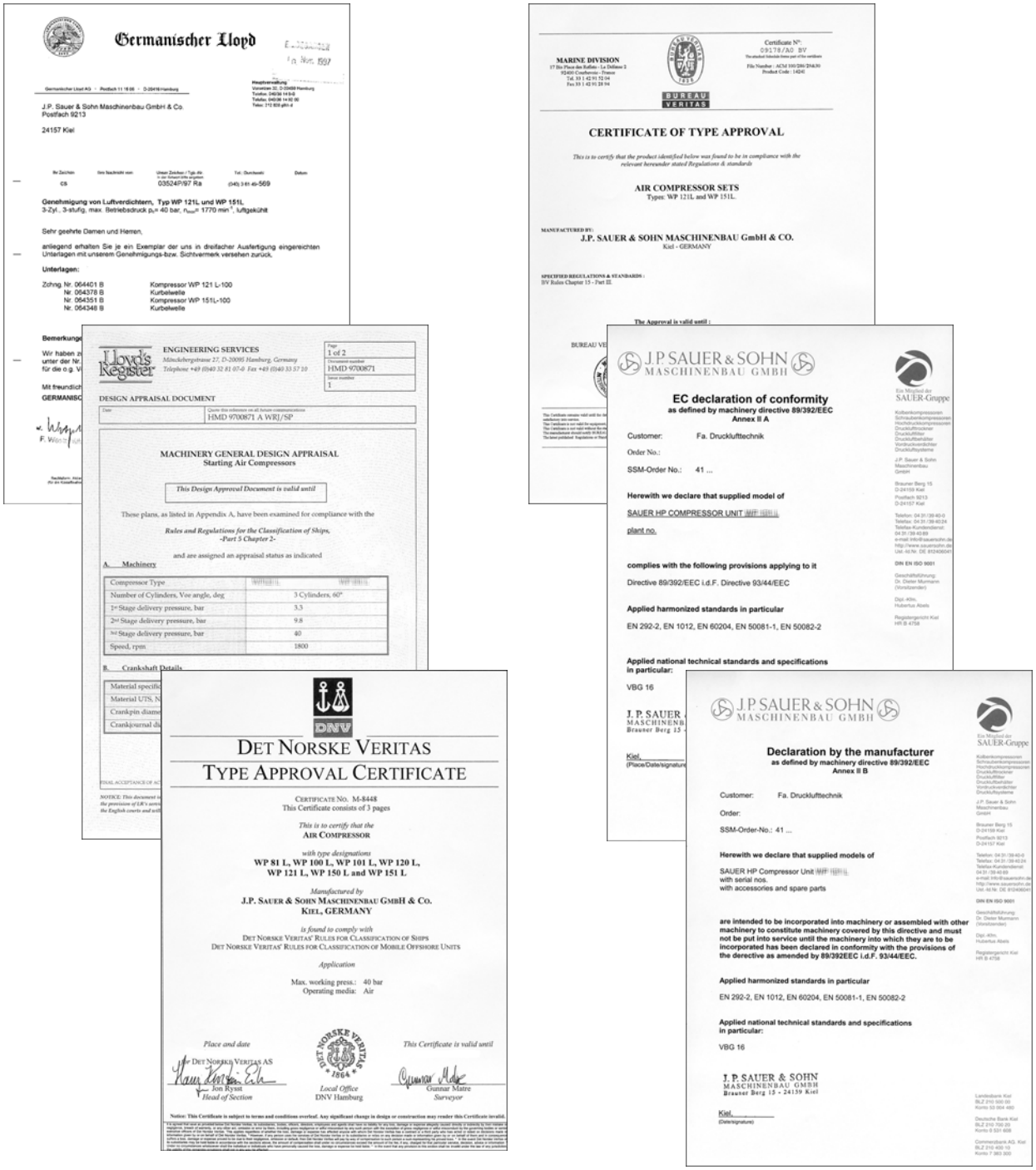
- High-pressure Compressor
- 2-stage
- Air-cooled

Ein Mitglied der
SAUER-Gruppe

Edition: 12 / 2010
Edited by: J.P. Sauer & Sohn Maschinenbau – Technical Documentation

WP33L_BA1_Titel_en_1009.fm

Sauer compressor Type Approvals



Germanischer Lloyd

J.P. Sauer & Sohn Maschinenbau GmbH & Co.
Postfach 9213
24157 Kiel

Genehmigung von Luftverdichtern, Typ WP 121L und WP 151L
3-Zyl., 3-stufig, max. Betriebsdruck p_e= 40 bar, n_{max}= 1770 min^{-1}, luftgekühlt

Sehr geehrte Damen und Herren,

anliegend erhalten Sie je ein Exemplar der uns in dreifacher Ausfertigung eingereichten Unterlagen mit unserem Genehmigungs-bzw. Sichtvermerk versehen zurück.

Unterlagen:

Zchng. Nr. 064401 B Kompressor WP 121 L-100
Nr. 064378 B Kurbelwelle
Nr. 064351 B Kompressor WP 151L-100
Nr. 064348 B Kurbelwelle

MARINE DIVISION

BUREAU VERITAS

CERTIFICATE OF TYPE APPROVAL

This is to certify that the product identified below was found to be in compliance with the relevant hereunder stated Regulations & standards

AIR COMPRESSOR SETS
Types: WP 121L and WP 151L

MANUFACTURED BY:
J.P. SAUER & SOHN MASCHINENBAU GmbH & CO.
Kiel - GERMANY

SPECIFIED REGULATIONS & STANDARDS :
BV Rules Chapter 15 - Part II.

The Approval is valid until :

Lloyd's Register

ENGINEERING SERVICES
Münckebergstrasse 27, D-20095 Hamburg, Germany
Telephone +49 (0)40 32 81 05-0 Fax +49 (0)40 33 57 10

DESIGN APPRAISAL DOCUMENT

HMD 9700871 A WRI/SP

MACHINERY GENERAL DESIGN APPRAISAL
Starting Air Compressors

This Design Approval Document is valid until

These plans, as listed in Appendix A, have been examined for compliance with the

Rules and Regulations for the Classification of Ships, -Part 5 Chapter 2-

and are assigned an appraisal status as indicated

A. Machinery

Compressor Type	
Number of Cylinders, Vee angle, deg	3 Cylinders, 60°
1st Stage delivery pressure, bar	3.3
2nd Stage delivery pressure, bar	9.8
3rd Stage delivery pressure, bar	40
Speed, rpm	1800

B. Crankshaft Details

J.P.SAUER & SOHN MASCHINENBAU GMBH

EC declaration of conformity
as defined by machinery directive 89/392/EEC
Annex II A

Customer: Fa. Druckluftechnik

Order No.:

SSM-Order No.: 41 ...

Herewith we declare that supplied model of

SAUER HP COMPRESSOR UNIT

plant no.

complies with the following provisions applying to it

Directive 89/392/EEC i.d.F. Directive 93/44/EEC

Applied harmonized standards in particular

EN 292-2, EN 1012, EN 60204, EN 50081-1, EN 50082-2

Applied national technical standards and specifications in particular:

VBG 16

J. P. SAUER & SOHN MASCHINENBAU GMBH
Brauner Berg 13 - 24139 Kiel

Kiel,
(Place/Date/signature)

Ein Mitglied der SAUER-Gruppe

DNV

DET NORSKE VERITAS
TYPE APPROVAL CERTIFICATE

CERTIFICATE NO. M-8448
This Certificate consists of 3 pages

This is to certify that the
AIR COMPRESSOR

with type designations
WP 81 L, WP 100 L, WP 101 L, WP 120 L,
WP 121 L, WP 150 L and WP 151 L

Manufactured by
J.P. SAUER & SOHN MASCHINENBAU GMBH & CO.
KIEL, GERMANY

is found to comply with
DET NORSKE VERITAS' RULES FOR CLASSIFICATION OF SHIPS
DET NORSKE VERITAS' RULES FOR CLASSIFICATION OF MOBILE OFFSHORE UNITS

Application

Max. working press.: 40 bar
Operating media: Air

Place and date
for DET NORSKE VERITAS AS
Jon Rysst
Head of Section

DET NORSKE VERITAS 1864
Local Office
DNV Hamburg

This Certificate is valid until
Gunnar Matre
Surveyor

Notice: This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.

J.P SAUER & SOHN MASCHINENBAU GMBH

Declaration by the manufacturer
as defined by machinery directive 89/392/EEC
Annex II B

Customer: Fa. Druckluftechnik

Order:

SSM-Order-No.: 41 ...

Herewith we declare that supplied models of

SAUER HP Compressor Unit
with serial nos.
with accessories and spare parts

are intended to be incorporated into machinery or assembled with other machinery to constitute machinery covered by this directive and must not be put into service until the machinery into which they are to be incorporated has been declared in conformity with the provisions of the derective as amended by 89/392EEC i.d.F. 93/44/EEC.

Applied harmonized standards in particular

EN 292-2, EN 1012, EN 60204, EN 50081-1, EN 50082-2

Applied national technical standards and specifications in particular:

VBG 16

J. P. SAUER & SOHN MASCHINENBAU GMBH
Brauner Berg 13 - 24139 Kiel

Kiel,
(Date/signature)

Ein Mitglied der SAUER-Gruppe

Note!

On this page only a few examples are shown. FurtherType Approvals are available on request.

Genuine Sauer spare parts – certified safety

Konformitäts- und Echtheitszertifikat

Seriennummer: 104000 *

Mit diesem Konformitäts- und Echtheitszertifikat bestätigt die

J.P. SAUER & SOHN
MASCHINENBAU GMBH
D-24157 Kiel,

daß die, und nur die, mit dem anliegenden Lieferschein
Nr. _____ gelieferten insgesamt _____ Positionen

Original Sauer Ersatzteile

mit kontrollierter, garantierter und nachvollziehbarer Qualität sind. Durch jede handschriftliche oder andere Veränderung nachträglich angebrachte Änderung auf dem anliegenden Lieferschein oder dem Zertifikat selbst wird dieses Zertifikat ungültig. Es liegen dann begründete Anzeichen vor, daß Graumarktteile minderer Qualität geliefert wurden.

SPECIMEN

In Zweifelsfällen, oder falls Sie über Ihre Vorteile durch den Einsatz von Original Sauer Ersatzteilen informiert werden möchten, wenden Sie sich bitte an unseren Kundendienst:
Durchwahl 04 31/39 40-86/87 (Fax -89),
e-mail: service@sauersohn.de
oder besuchen Sie unsere Webseite http//www.sauersohn.de.

Kiel, den _____ _____

Table of Contents

1 General information

1.1 Foreword

This Operator Manual provides installation guidance, safe operation, maintenance and repair instructions with illustrated parts list.

The following unique specification for the Sauer compressor can be found on the nameplate affixed to the compressor:

– Compressor type
– Serial number
– Year of construction

We recommend you enter this information in Chapter 11 "Spare parts and accessories" and always provide this data when requesting parts and any repair instructions.

1.2 Precautionary measures

Specific precautionary measures

We recommend that only authorised and trained personnel operate and service the Sauer compressor. Such responsible personnel must have read and understood the Operator Manual. These instructions should always be available where the compressor is installed.

Copyright

1.3 Warranty and liability

Sauer can no longer provide warranty coverage or be held liable for any claims if a failure is attributed to any of the following:

- Use of the machine not as specified
- Substitution of parts not manufactured or approved by Sauer
- Use of spare parts that are not genuine Sauer spare parts
- Operation of the machine with faulty or improperly installed safety and/or protection devices
- Failure to observe the Operator Manual
- Unauthorised modification to the machine or its control system
- Inadequate monitoring of machine parts subject to wear
- Failure to carry out maintenance/repairs in accordance with Sauer instructions
- Force majeure

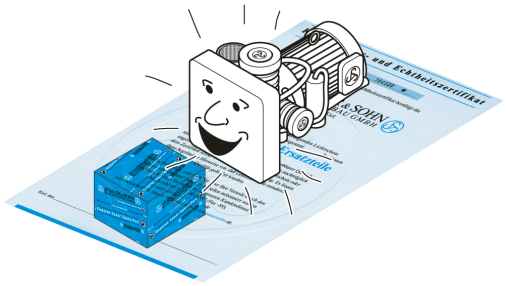
1.4 Type approval and genuine Sauer spare parts

- Type approval for the Sauer compressor is valid under the condition that parts and components specified and qualified by J.P. SAUER & SOHN are used. Type approval is provided by the Classification Society and the EC Declaration of Conformity or EC Manufacturer's Declaration. Failure to observe these requirements may void type approval.
- Only the use of genuine Sauer spare parts will ensure compliance with these specifications and, therefore, reliable and safe operation of the Sauer compressor.
- If non-genuine Sauer spare parts are used, we reserve the right of exclusion from liability for personal injury and equipment damage.
- Genuine Sauer spare parts are supplied with a Certificate of Conformity and a Certificate of Authenticity. An example of this document is shown just before the Table of Contents in these instructions. If spare parts are delivered to you without this certificate, there is a risk that these are not genuine Sauer spare parts. In such an instance please contact our Customer Service.

Note!

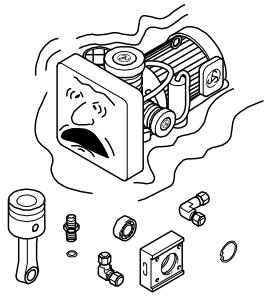
This is a high-pressure compressor. For your own safety and for reliable compressor operation, use genuine Sauer parts only.

Correct



Only use genuine Sauer spare parts supplied with a certificate!

Incorrect



Do not use parts from the “grey market” !

1.5 J.P. SAUER & SOHN Customer Service

Should you have any technical questions or questions related to maintenance or repair, please contact our Customer Service:

J.P. SAUER & SOHN Maschinenbau GmbH
Customer Service
P.O. Box 92 13
24157 Kiel, Germany

Phone (international):	
Technical information	+49 431 39 40 -87
Spare parts orders	+49 431 39 40 -86/886
Fax (international):	+49 431 39 40 -89
Emergency service (international):	+49 172 4 14 63 94
E-mail:	service@sauersohn.de
Web:	www.sauersohn.de

Note!

If you have questions regarding your Sauer compressor, please specify the compressor model and serial number (see Chapter 11 “Spare Parts and Accessories” or nameplate on the compressor).

1.6 Specific instructions

Lists

General lists are marked using a dash.

Example:

The compressor cooling system consists of

– Fan wheel
– Fan wheel housing and
– Cooler assembly

Instructions

Individual instructions or multiple instructions requiring action but where the sequence is of no importance are normally denoted by a bullet point.

Example:

• Check oil level.

Instructions which must be followed in a certain sequence are numbered.

Example:

1. Turn the main switch ON.
2. Choose the operating mode.
3. Turn the control ON.

Results of actions carried out are denoted by a tick mark.

Example:

✓ The control light is on.

Safety instructions

Safety and warning instructions are presented using icons with clear instructions. The safety instructions are described in detail in Chapter 2 “Safety”.

2 Safety

2.1 Conditions of Use

This Sauer compressor must be used for the compression of air only. The Sauer compressor must not be used at ambient temperatures below +5 °C. Any other unauthorised use requires the express written approval of J.P. SAUER & SOHN.

In addition, specified conditions of use also include observing the Operator Manual and the installation requirements and maintenance intervals described there.

Most accidents which occur during operation and maintenance of machinery result from failure to observe basic safety rules or precautionary measures.
When handling, operating or carrying out maintenance, personnel must observe safe engineering working practices and local regulations.

2.2 Unauthorised modification

Unauthorised modification of the Sauer compressor is not permitted. Modifications may lead to an accident that can be life-threatening, cause personal injury or result in damage to the equipment.

Contact J.P. SAUER & SOHN and request written approval of any planned modifications.

2.3 Safety Information - Warning and Caution

The safety information in these instructions is presented as ‘high’ risk and ‘lower’ risk, as follows:

Warning - Danger!

High risk.
Ignoring these safety instructions can cause personal injury, or death, and significant equipment damage.

Caution - Note!

Lower risk.
Disregarding this safety note may result in damage to the equipment.

2.4 Safety Warnings on the Machine

Danger!

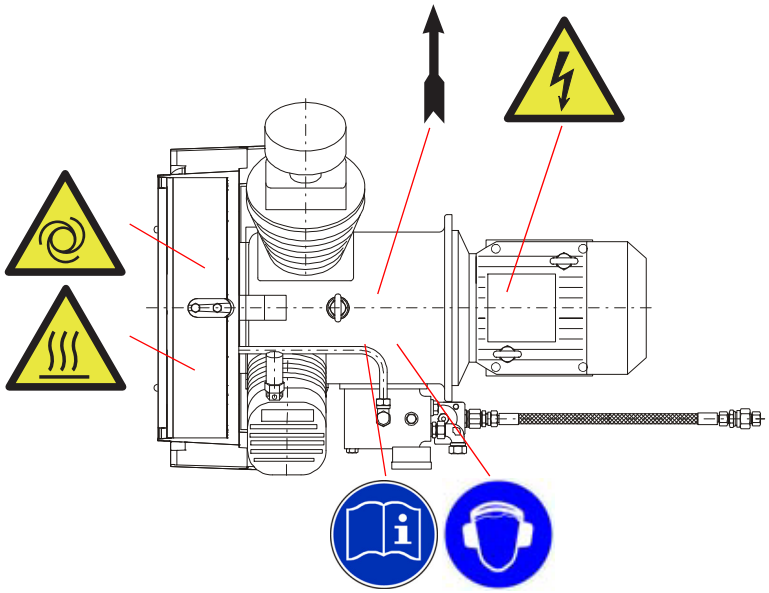
Safety labelling affixed to the machine must not be altered or removed. Replace damaged or lost safety labels immediately with an exact replica.

The Sauer compressor with an EC Manufacturer's Declaration or EC Declaration of Conformity is marked with the following safety labelling:

Safety marking	Meaning
	High voltage! Danger to life!
	Compressor starts automatically without warning!
	Hot surface!

Safety marking	Meaning
	Read Operator Manual!
	Wear hearing protection!
	Rotational direction of the crankshaft

Location of safety markings



2.5 Safety and protection devices

Danger!

Safety devices must not be adjusted, tampered with or removed.

The safety devices must be periodically tested and checked:

Safety valves must only be

– installed with a lock-seal and
– replaced, adjusted and re-sealed by authorised personnel.

Safety valves

Each compression stage of the Sauer compressor is equipped with a safety valve, which will fully discharge air when the blow-off pressure is reached.

Safety valves are installed at the following locations:

– 1st compression stage: in 2nd stage cylinder head;
– 2nd compression stage: in the condensate separator after the 2nd stage.

Safety fuse

The Sauer compressor is equipped with a safety fuse in the final separator to protect the unit in case the compressor cooling fails. The safety fuse melts at 121 °C and releases an exhaust port for the compressed air if the temperature limit is exceeded.
The safety fuse can only be used once. The safety fuse must be replaced by a new one if it has tripped.

High air temperature switch

As an alternative to the safety fuse, the Sauer compressor can be equipped with a high air temperature switch. The high air temperature switch shuts down the compressor if the compressed air temperature exceeds the limit value.

Final pressure switch

The Sauer compressor is equipped with a final pressure switch which trips as soon as the final pressure is reached. The factory setting for this sensor is adjusted to match the respective final pressure.

2.6 Noise protection

Sound pressure level details are found in the Technical Specification (see Chapter 4).

The Sauer compressor can be equipped with a sound-dampening enclosure to reduce noise, available as an accessory from J.P. SAUER & SOHN.

Danger!

When the compressor is operated without sound-dampening enclosure, hearing protection should be worn when working near the compressor.

2.7 Waste disposal

Note!

The following materials which accumulate during operation of the compressor must be disposed of in an environmentally sound manner in accordance with applicable laws:

- Condensate (oil/water) arising from inter-cooling in the compression process
- Used oil and grease, and rags soiled by oil and grease
- Cleaning agents and rags soiled by such agents

2.8 Safety requirements for personnel

Only personnel authorised by J.P. SAUER & SOHN are permitted to service the Sauer compressor! Before commencing work they must have read and understood the instructions in the Operator Manual, and must be familiar with all safety devices and safety regulations.

In addition to the instructions in this Operator Manual and supplier documentation, accepted engineering standards must be observed as well as all local laws, standards and regulations such as the

- Equipment and Product Safety Act
- Industrial Health and Safety Regulations
- Regulations for accident prevention pertaining to compressors
- VDE (Association of German Electricians) regulations and
- Regulations on environmental protection.

Additionally, where appropriate classification society regulations and operational regulations must be observed.

Only persons who are trained and thoroughly familiar with compressor operation should be authorised to operate the compressor.

Persons authorised to perform maintenance work are trained specialists of the operator and of the manufacturer.

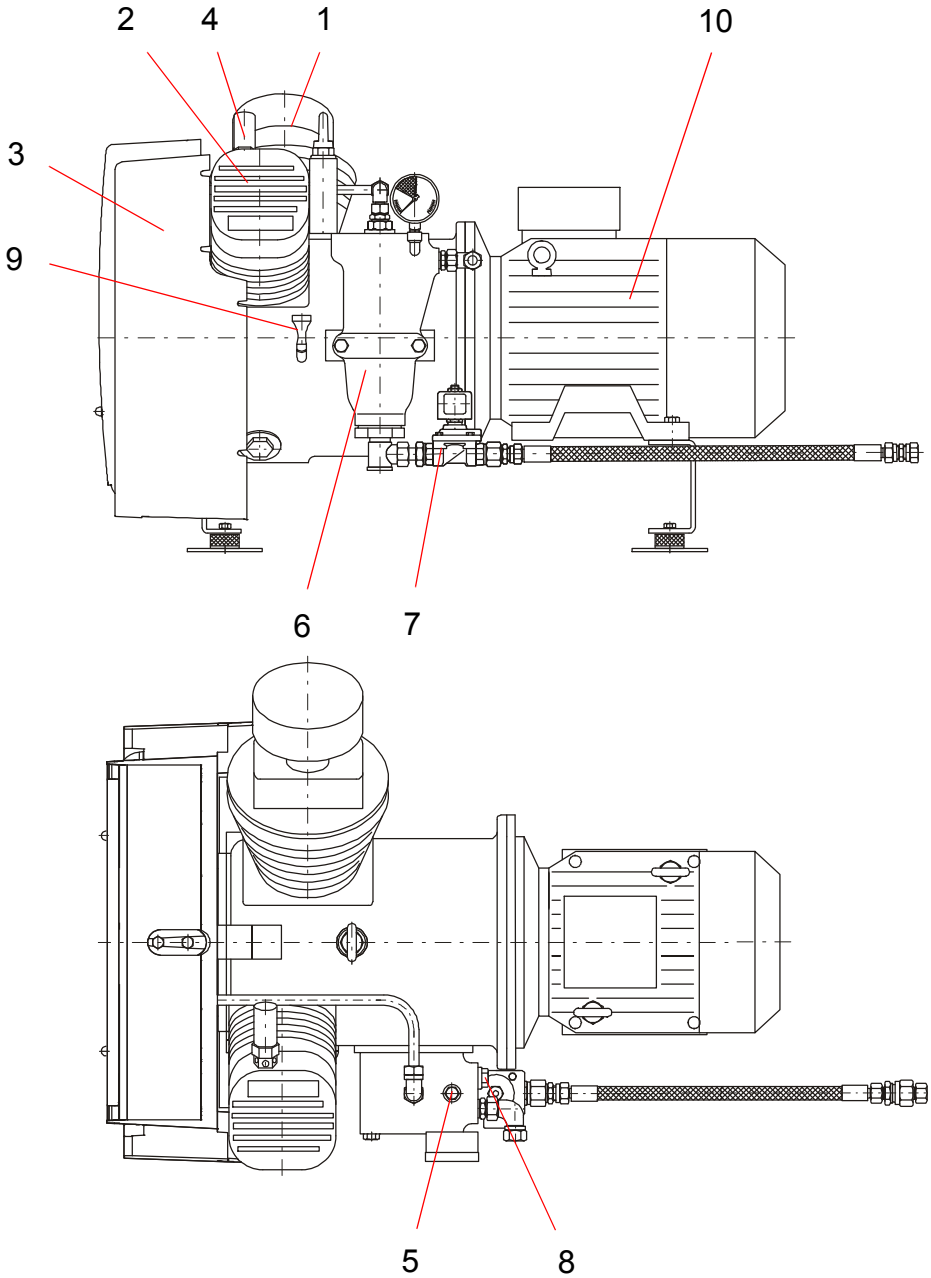
2.9 Personal protective equipment

The owner should provide personal protection (e.g. hearing protection, safety boots, etc.) for personnel carrying out any work on the Sauer compressor.

3 Design and function

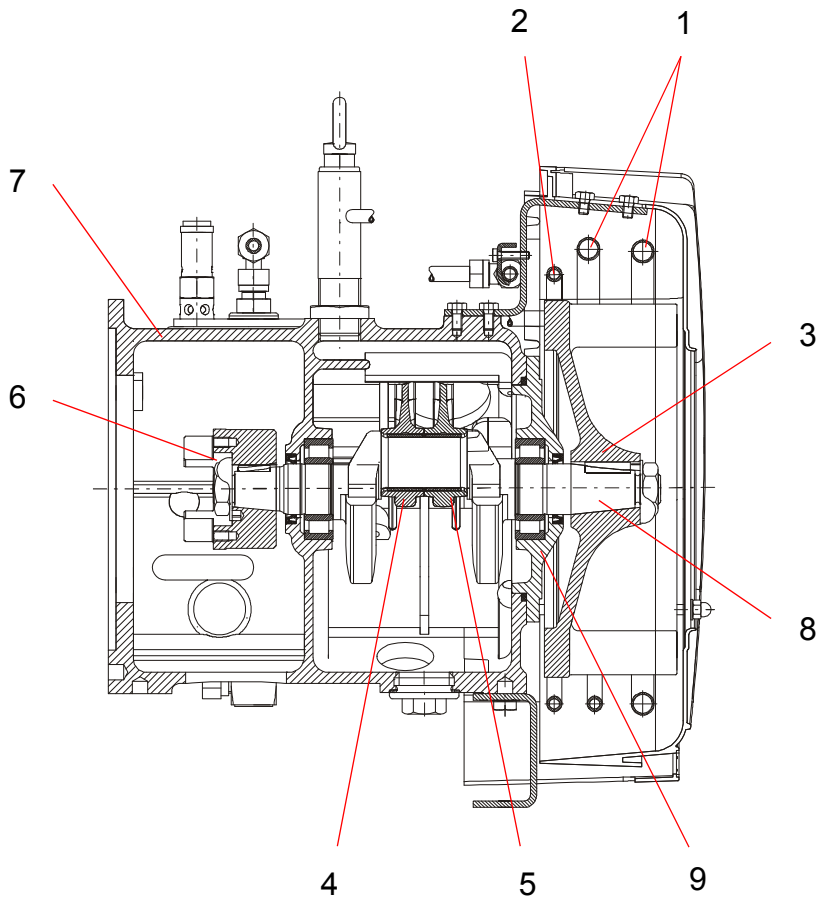
3.1 Overview

Note!
Details of parts and spare parts can be found in the spare parts catalogue.



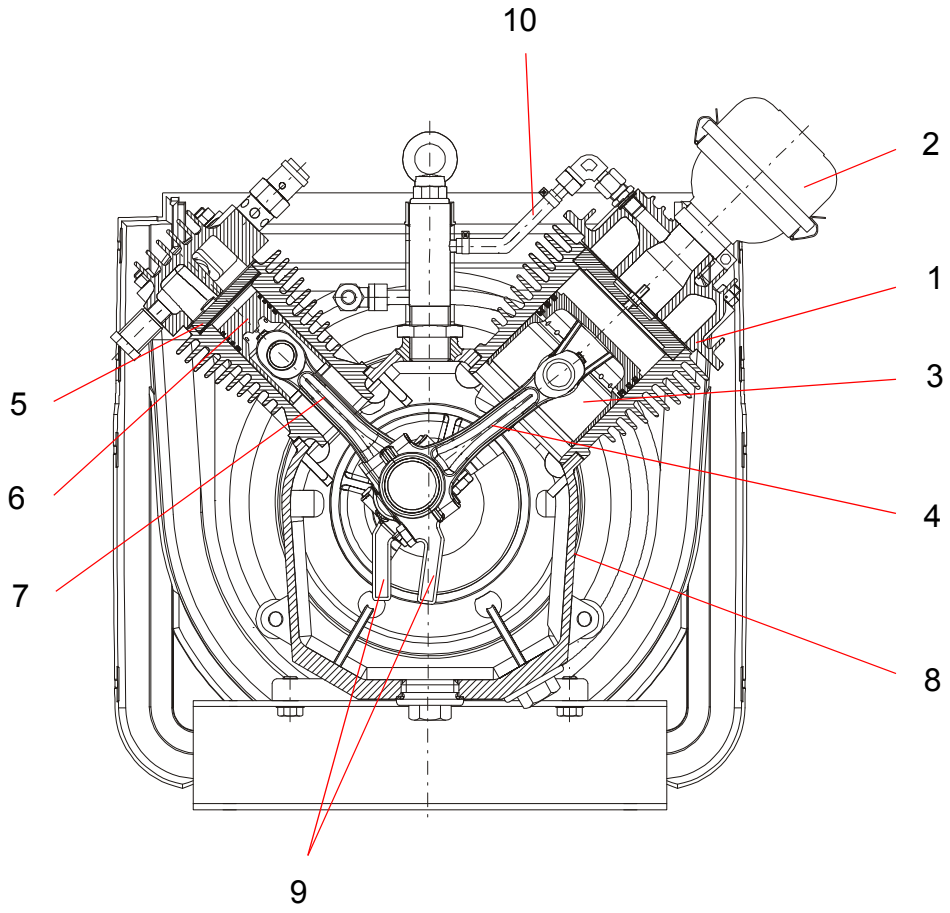
Item	Designation
1	Cylinder 1st stage
2	Cylinder 2nd stage
3	Cooler
4	Safety valve 1st stage
5	Safety valve 2nd stage
6	Condensate separator
7	Drain valve
8	Fusible plug
9	Oil dipstick
10	Motor

Vertical- section view



Item	Designation
1	Cooler 1st stage
2	Cooler 2nd stage
3	Fan wheel/flywheel
4	Connecting rod 1st stage
5	Connecting rod 2nd stage
6	Flexible coupling with compressor half coupling
7	Bell housing
8	Crankshaft
9	Bearing housing

Cross-section view



Item	Designation
1	Cylinder with head and valve 1st stage
2	Air filter
3	Piston 1st stage
4	Connecting rod 1st stage
5	Cylinder with head and valve 2nd stage
6	Piston 2nd stage
7	Connecting rod 2nd stage
8	Crankcase
9	Lubricating pin
10	Vent line

3.2 Functional description

Drive

The Sauer Compressor is driven by an electric motor flange-mounted to the crankcase bell-housing. The power is transmitted by means of a flexible coupling. The fan wheel on the crankshaft is also used as flywheel.

Compressor control

The Sauer compressor is electronically controlled and monitored by a compressor control. This control system must comply with legal regulations. Optionally, J.P. SAUER & SOHN supplies a suitable compressor control.

Compression

The compressor takes in the ambient air via a layered filter with a tube silencer and compresses it in two compression stages with a total of two single-stage cylinders to the final pressure. Each cylinder is a compression stage, after which the air is inter-cooled.

The compression temperatures are below the flash point of standard mineral-based motor oils.

The cylinders arranged in a V-configuration are equipped with lamellar valves which are easy to maintain and have a long service life. Due to the low compression temperatures, there is virtually no coking on the valves.

Cooling

An axial fan mounted on the crankshaft as a fan wheel/flywheel combination sucks cooling air from ambient air and blows it across the cylinders, coolers, valves and oil pan. Inter-cooling takes place after each stage in zinc-coated finned tube coolers.

Condensate separation

Oil/water condensate that collects during compression and inter-cooling is collected in the condensate separator after the 2nd stage.

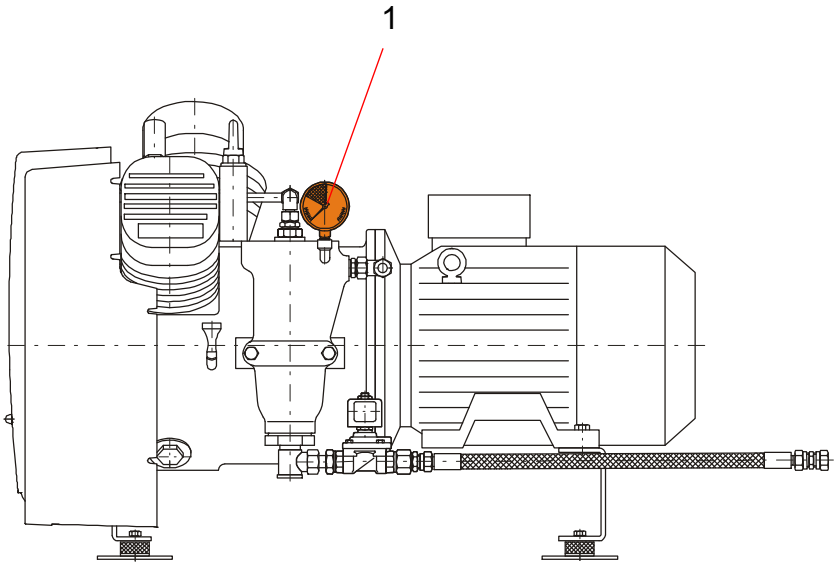
Oil/water draining and pressure relief

Condensate is drained via a drain line. A solenoid valve is used as drainage valve and is installed in the drain line. The drain valve must be open when the Sauer compressor is unpressurised. A few seconds after starting, the drain valve should close and the compressor should power up against system pressure. The drain valve should drain the system during operation at preset intervals. The control of the drain valve (solenoid valve) is carried out by the compressor control.

Lubrication

The drive is lubricated by oil splash or mist in the crankcase. The lubricating pins on the connecting rod dip into the oil pan and fling the lubricating oil against the lubricating points.

3.3 Displays on the Sauer compressor



Item	Designation	Indicator
1	Pressure gauge	Final pressure of the compressed air after the 2nd stage

3.4 Indicators and operating elements on the compressor control

Note!
If the compressor control is supplied by J.P. SAUER & SOHN, read the documentation supplied.

On the front of the compressor control, the following indicators and operating elements can be found:

Display/ operating element	Explanation
Signal lamp “Operation”	Illuminates when the compressor is running.
Fault indicator lamp “Overcurrent”	Illuminates if the compressor has shut down because of excess motor current.
Run time counter	Indicates the hours the compressor has run.
Operation mode selector	• “Manual” mode: Starts the compressor manually. The compressor starts up and continues to run until it is manually turned off again. • Selector position “0”: Turns the compressor off manually. Any pending fault messages are reset. • “Auto” mode: The compressor starts and stops with the opening and closing of a remote contact (e.g. pressure switch at a compressed air vessel).
Main switch	Disconnects the power supply from the compressor control to the compressor. A main isolator switch should be installed if required by local law and regulations.

4 Technical Specification

4.1 Specification data

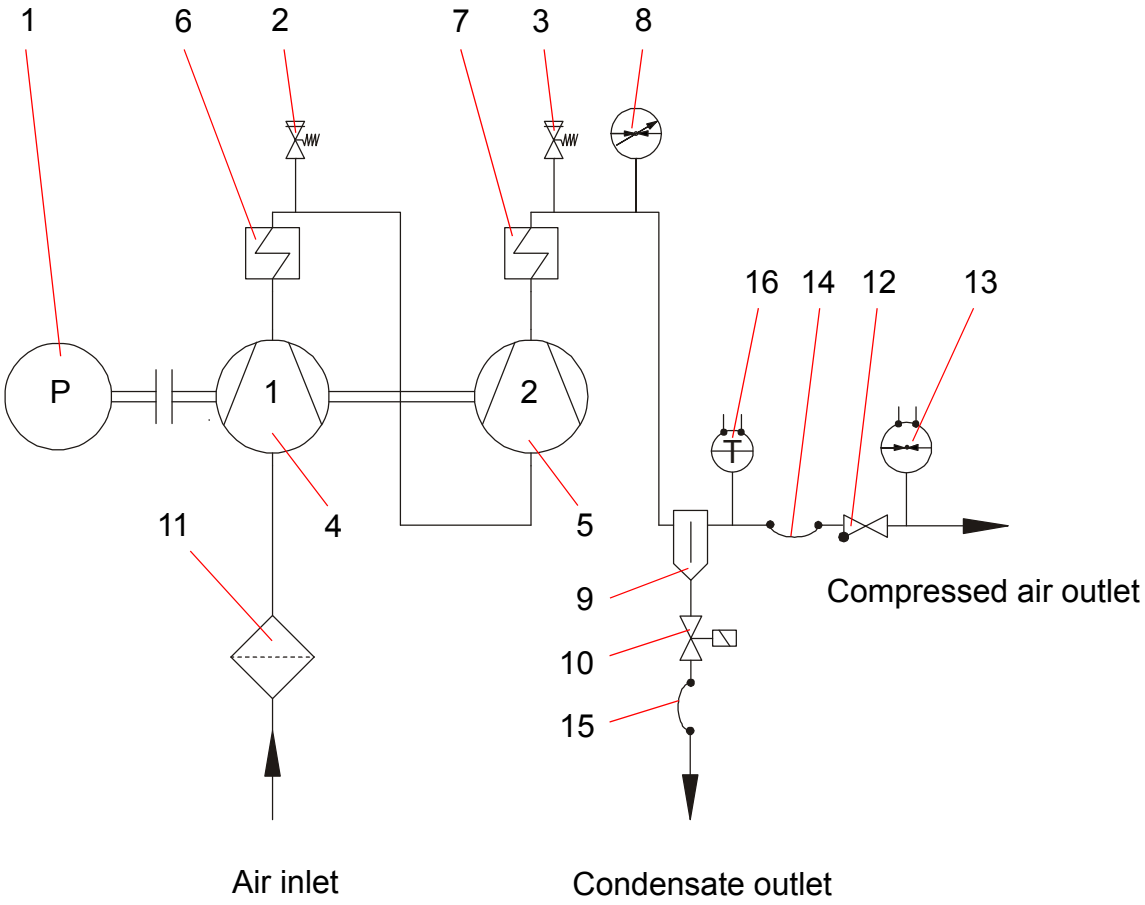
Designation	Data
Compressor type	WP 33L
Number of cylinders	2
Number of compression stages	2
Cylinder diameter 1st stage	100 mm
Cylinder diameter 2nd stage	46 mm
Piston stroke	59 mm
Maximum speed	1800 rpm
Direction of rotation (when looking toward flywheel)	Clockwise
Maximum working pressure	35 bar
Permissible suction pressure	Maximum 1300 mbar (a) Minimum 900 mbar (a)
Set pressures for safety valves:	
1st stage	8 bar
2nd stage	5 % above final pressure
Oil sump capacity	1.5 l
Oil refill quantity – dipstick MAX/MIN	0.5 l
Oil type	See Chapter 10 “Lubricant Table”
Solenoid valves:	
Pickup and holding power	18 VA/14 W
Setting	Currentless open; Relief starting: approx.15 s; Periodic automatic drainage: every 15 min for 15 s

Designation	Data
Final pressure switch (option):	
Maximum switching current	6 A/220 V
Setting	As required by customer
Switch function	Change-over contact
Non-return valve:	
Actuation pressure	approx. 1 bar
sound pressure level (free field at 1 m)	max. 88 dB(A)
Weight and dimensions	See installation drawing

Note!

Please refer to the order-specific documentation of your compressor for data such as final pressure, speed, power requirements, etc.

4.2 P&I Flow Diagram



Item	Designation
1	Drive motor
2	Safety valve 1st stage
3	Safety valve 2nd stage
4	1st compression stage
5	2nd compression stage
6	Cooler 1st stage
7	Cooler 2nd stage
8	Pressure gauge 2nd stage
9	Condensate separator
10	Solenoid valve (drainage)
11	Suction filter
12	Non-return valve
13	Final pressure switch
14	High pressure hose
15	Hose
16	Temperature switch

5 Transport and Installation

5.1 Transport

Shipping

The machine is packed ready for shipping.

- The Sauer compressor must be checked for completeness and any damage immediately upon receipt.
- Damage to the packaging or the machine must be reported to the transport firm and J.P. SAUER & SOHN immediately.

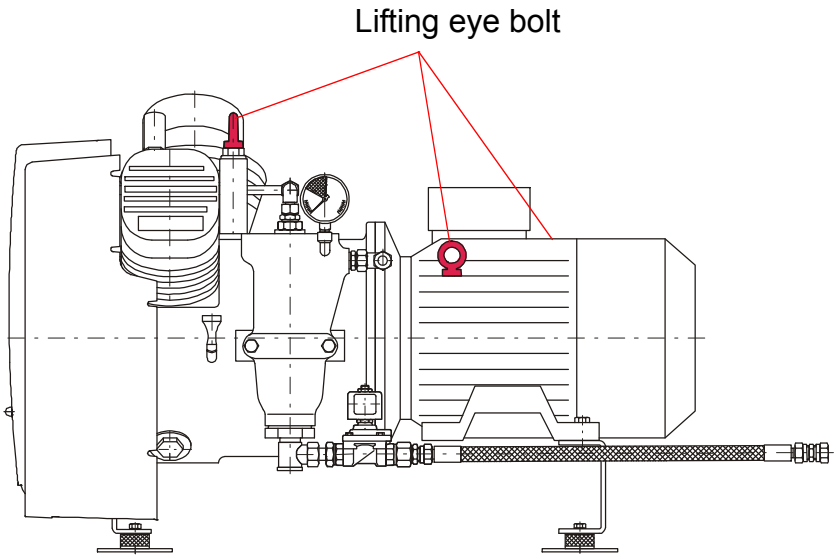
Transport

The Sauer compressor must be transported using a forklift truck or be hoisted by a crane.

Danger!

Suspended load during transport.
The forklift truck/crane must have sufficient load-bearing capacity.

- Ensure that no personnel are within the danger area of the suspended load and the forklift truck/crane.
- Sling the unpacked compressor onto both or all three lifting eye bolts (1 lifting eye bolt on the crankcase, 2 lifting eye bolts on the motor) (see illustration).
- Raise, move into position and set down with care.



WP33L_BA1_K1_12_en_1009.fm

5.2 Storage before Installation

If the Sauer compressor has to be stored before installation, do not unpack, and store under the following conditions:

– Temperature: +5 to +40 °C
– relative humidity 30 … 95 %, non-condensing
– In a dry area, under a roof, with dew protection
– Protected from being soiled
– Protected against vibration and shock

Note!

The standard factory protective packing is sufficient for a maximum storage period of 12 months.

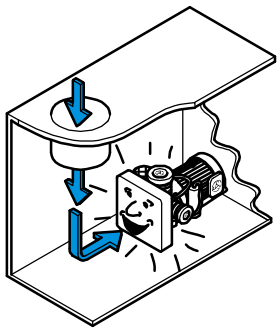
5.3 Installation

Note!

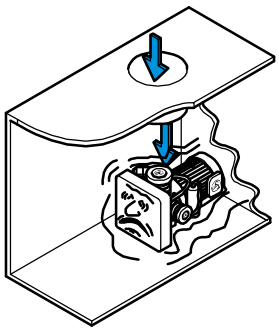
If in doubt regarding the suitability of the intended installation area, please contact J.P. SAUER & SOHN. If required for the installation area, Sauer can provide help with the design of a ventilation system.

For proper installation, follow the installation instructions and observe the following conditions.

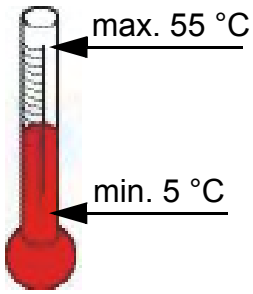
Correct



Incorrect



Installation requirements



– The installation area must be dry and free from dust.
– Ensure that the installation is ventilated in such a way that the heat generated during operation is removed.
– Room temperature during operation of the Sauer compressor: +5 °C … +55 °C
(Please contact J.P. SAUER & SOHN for operation outside this temperature range).

Note!

The air temperature at the cooling air inlet of the compressor must not exceed +55 °C during operation. Conditions in the area of installation as well as the heat generated by the compressor and any other machines installed in the same area must be kept in mind.

- If necessary, install a ventilation or air extraction system in the area.
- Install the fresh air feed in such a way that the cooling air stream is never directed at the compressor. Otherwise, there is a danger that condensation will occur within the machine, with corresponding consequential damage.

– At room temperatures below +5 °C the room must be heated or a heater must be installed on the Sauer compressor.
– The installation location must be selected in such a way that the Sauer compressor is easily accessible and the servicing intervals (see installation documentation) are maintained.
– Position so that the fan does not suck in heated air again.
– Do not position several compressors behind each other so that a compressor does not suck in the heated cooling air of another compressor.

Note!

J.P. SAUER & SOHN would be pleased to advise you on installation of the compressors.

Foundation

Note!

The standard delivery anti-vibration mount has a resonant frequency of approx. 10 Hz.
Excitation of the compressor foundation by vibrations from other machines installed in the vicinity must not be in the 10 Hz range. Otherwise there is a danger that the standard anti-vibration mount could be destroyed by resonating vibration.

1. Check whether there are vibrations of the machine foundation in the 10 Hz range.
2. If in doubt, contact J.P. SAUER & SOHN in order to clarify whether a different anti-vibration mount can be used.

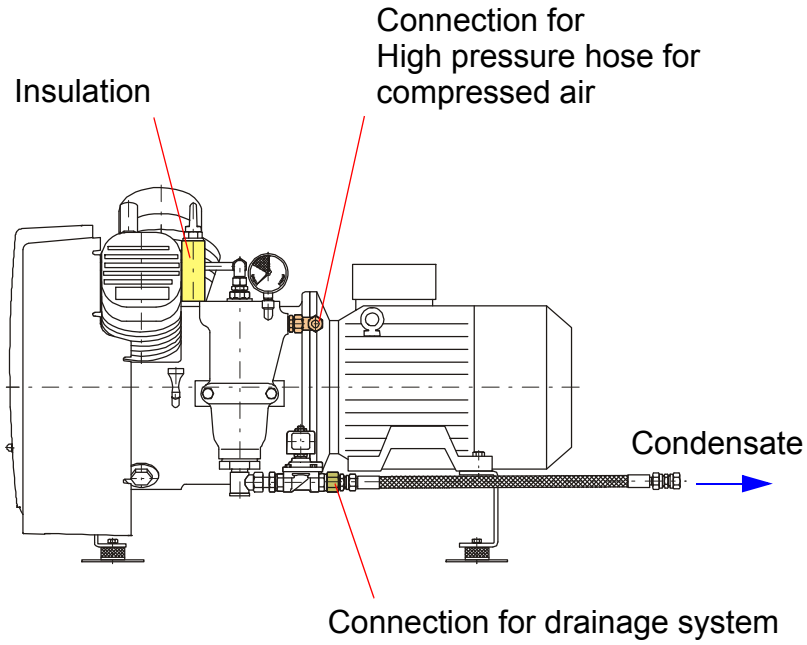
5.4 Connecting the compressor

Danger!
The compressor must only be connected by a qualified technician. Any work on the electrical installation must be carried out by qualified electricians only.

Note!
The oil filler tube is protected with an insulating hose. The insulation material must not be removed.

Pipelines

The compressed air outlet and drainage connection of the Sauer compressor must be connected by hose connections to any of the system owner's permanent piping.

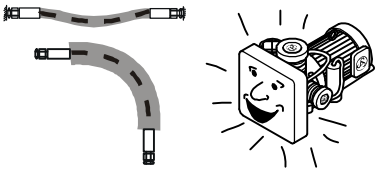


Danger!

At the compressor start-up and during drainage compressed air escapes from the drainage connection. Consequently, do not operate the compressor without hose lines connected.

The hose lines must be installed free of tension and not twisted.

Correct



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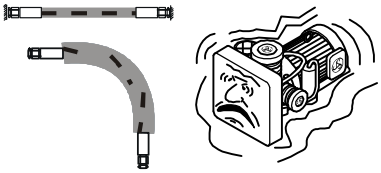


Drainage

Note!

Accumulated condensate contains oil. It may only be disposed of in compliance with applicable legal regulations.

J.P. SAUER & SOHN offers condensate processing systems for separating oil from condensate.

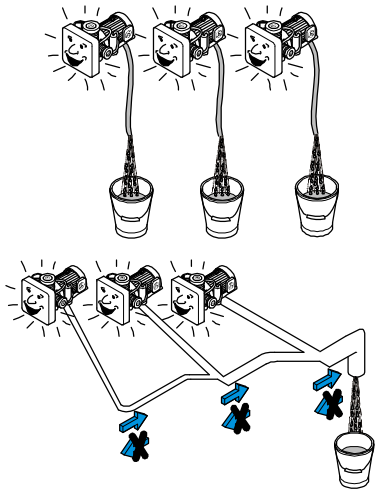
Note!

We recommend connecting up the compressor drainage separately.

If you wish to combine the drainage of **several compressors**, please observe the following:

– Choose a sufficient nominal diameter for the common drain line;
– Connect the drain lines of the individual compressors at a sharp angle to the common drain line, so that no pressure can build up in the drain line of a compressor that is not in operation.

Correct



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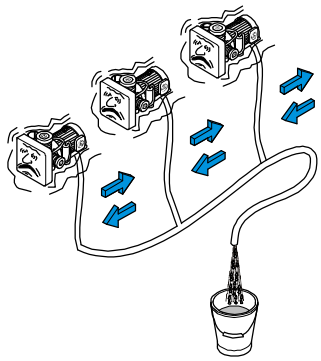
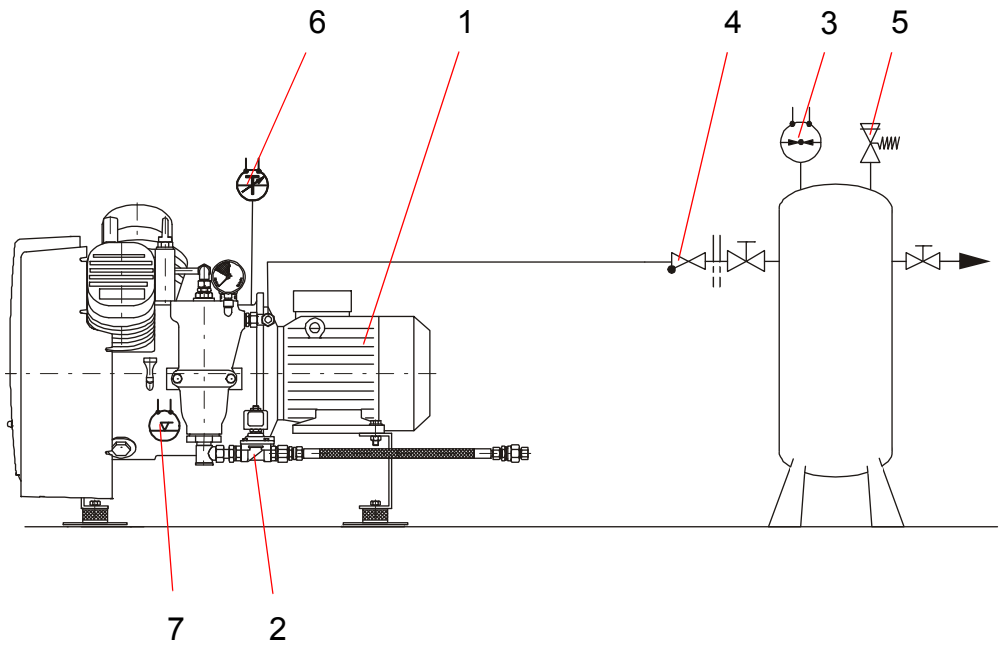


Connections

The illustration below shows the connections and the fittings for the operation of a typical Sauer compressor.



Item	Designation	Type	Function
1	Drive motor	AC motor	Compressor drive
2	Drain valve	Solenoid valve	Start relief and drainage
3	Final pressure switch	Change-over switch	Start/stop control for the compressor
4	Non-return valve	Plug valve	Prevent compressed air flowing back
5	Safety valve	Spring-loaded safety valve	To limit excessive pressure on the parts subjected to pressure
6	High air temperature switch (option):	Change-over switch	Switch off compressor if temperature is too high
7	Oil level switch (option)	Change-over switch	Switch off compressor if there is a lack of oil

Note!

For technical specifications of the individual items, please refer to Chapter 4.

5.5 Adjusting the final pressure switch

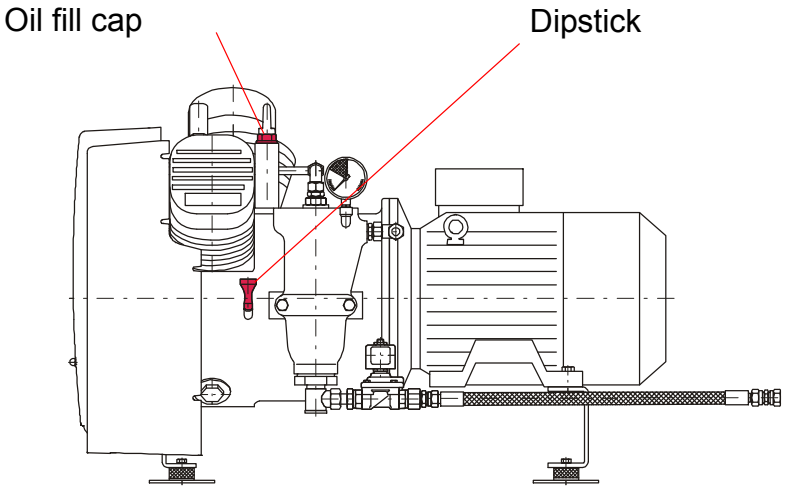
Note!

The final pressure switch must be connected directly at the compressed air vessel to ensure smooth, even compressor operation.

Pay attention to the pressure loss between the compressor and compressed air vessel when selecting the maximum pressure setting. If the final pressure selected is too high, the safety valve of the final stage blows off.

5.6 Filling with oil

Note!
Unless otherwise ordered, Sauer compressors are delivered without oil filling.



Danger!
Make sure to fill the crankcase of the compressor with oil before initial operation!
Use an appropriate lubricating oil (see Chapter 10 “Lubricant Table”).
Note the amount of oil needed (see Chapter 4 “Technical specification”).

1. Unscrew the oil fill cap (red).
2. Pour in oil and check the oil level with the dipstick (red).

Note!
Only fill with oil up to the upper mark on the oil level indicator. Overfilling increases the oil consumption of the compressor.

3. Replace the dipstick and screw the oil fill cap back in.

5.7 Checks to be carried out after installation and before the first start-up.

- Check that the electricity connection matches the data on the nameplate.
- Check that all connections between the compressor and the compressed air equipment are properly installed. Pay particular attention to the compressed air connection.
- Are the drain lines properly connected? See Chapter “Drainage system”.
- Has the crankcase been filled with oil?
- Have all tools and foreign objects been removed from the compressor?
- Check that the cooling air inlet is not hindered or blocked.
- Is the entire unit clean?

6 Operation

6.1 Safe operation

Danger!

Only authorised persons are permitted to put the Sauer compressor into operation and operate it!

Danger!

Only switch on and start the compressor when

– it has been checked that it is in perfect condition;

– all tools and foreign objects have been removed from the machine.

Danger!

Immediately turn compressor off if personnel and property are endangered. Only re-start compressor when there is no more danger or possible damage.

Danger!

In Automatic mode the compressor starts automatically without warning.

Danger!

Risk of burns from touching hot surfaces of the compressor during operation. Wear protective gloves.

Danger!

Risk of hearing damage because of the sound pressure level while the compressor is running! Wear hearing protection near the compressor.

Note!

Switch compressor off in the event of any abnormal/fault conditions or unexpected events. Eliminate the cause of the problem with the help of Chapter 7 “Troubleshooting.”

6.2 Operating modes

After you have turned on the power supply to the Sauer compressor, it can be started with one of the following two operating modes using the mode selector setting:

– “**Manual**” operating mode:
  The compressor starts and continues to run until it is stopped or turned off either by using the mode selector switch or the main switch.

– “**Automatic**” operating mode:
  Starting and stopping the compressor is controlled by external devices (for example using the pressure switch of the pressure vessel).

When the Sauer compressor starts, it starts without load with the drain valves open. After a few seconds the valves close and the compressor powers up against system pressure.

6.3 Initial operation

Check the direction of rotation

Allow the Sauer compressor to run only for a few seconds to check the direction of rotation.

1. Switch the power supply on.
2. Set the mode selector switch to “Manual” to start the compressor in manual mode.
3. Immediately check the compressor’s direction of rotation. It must rotate in the direction indicated by the arrow on the crankcase.
4. Set the mode selector switch to “0” to stop the compressor.
5. Switch off the power supply.
6. If the direction of rotation is incorrect, the polarity of the electric motor should be changed by a qualified electrician.

Test run

1. Switch the power supply on.
2. Set the mode selector switch to “Manual” to start the compressor in manual mode.

✓ If correctly adjusted, the drain valves close after about 15 seconds and the compressor should power up against system pressure.

3. Check the function of the periodic automatic drainage.

✓ It must drain for about 15 seconds every 15 minutes. This is indicated by a drop in pressure on the pressure gauges.

4. Set the mode selector switch to “0” to stop the compressor.
5. Switch off the power supply.
6. If necessary eliminate the cause of deviations from nominal values and malfunctions. See also Chapter 7 “Troubleshooting”.
7. Complete the commissioning certificate and send it to J.P. SAUER & SOHN Customer Service. The commissioning certificate is in the Appendix.

6.4 Routine operation

Cleaning

- Keep compressor area clean.
- Keep indicators and operating elements clean.

Checks

- Inspect connections, pipes and electric cables for damage.
- Check the oil level once a week before starting, top up, if necessary. Do not overfill with oil beyond the maximum mark.

Operation

1. Switch the power supply on.
2. Set mode selector switch to “Auto“ to operate the compressor in Automatic mode.

Watch out for

- abnormal operating noise.
- Pay attention to leaks (compressed air, oil, condensate).
- In the event of deviations, see Chapter 7 “Troubleshooting”.

Note!

Compressors may only be started five to six times within one hour.
The minimum period of operation must be 10 minutes per start.

7 Troubleshooting guide

Note!

- Should a malfunction occur, first check the indicators on the compressor control panel and on the compressor.
- Try to correct the fault with the help of the table below.

If the fault cannot be corrected, please contact J.P. SAUER & SOHN Customer Service. The fault description journal is in the Appendix of this Operator Manual.

Fault	Probable cause	Remedy
Operation with compressor control: Compressor does not start or switches off.	No input power supply/no control voltage.	Check the fuses. Replace blown fuses.
Operation with compressor control: Compressor was switched off, fault indicator lamp “Oil level” (option) lights up.	Oil level too low.	Check oil level and top up if necessary. Check for leaks.
	Oil too viscous.	Fill with recommended oil. Check that room temperature is > + 5 °C.
Operation with compressor control: Compressor was switched off by overcurrent delay, fault indicator lamp “Overcurrent” lights up.	Motor is overheated. Excessive current drawn.	Check supply voltage and electrical connections. The compressor can be started again after a cooling down period.
		Check whether the crankshaft can easily be turned by hand. If not, disconnect and ascertain whether the problem has to do with the motor or the compressor.
	Piston seizure	Check cylinders and pistons for any score marks, replace as necessary.

Fault	Probable cause	Remedy
Safety valve of 1st stage blows off:		
Pressure exceeds blow-off pressure (8 bar)	2nd stage valve is not working properly.	Check the valve of the 2nd stage and replace if necessary.
	Gasket between suction and pressure side of the 2nd stage is faulty.	Replace gasket.
Pressure below blow-off pressure (8 bar)	Safety valve is faulty.	Replace safety valve.
Safety valve of 2nd stage blows off:		
Pressure above blow-off pressure (final pressure + 5%)	Valve in the air line to the compressed air vessel is closed.	Open valve.
	Pressure switch is set too high.	Lower the pressure setting.
Pressure below blow-off pressure (final pressure +5%).	Safety valve is set too low or is faulty.	Replace safety valve.
	Excessively high pressure losses in the air line to the compressed air vessel.	Reduce the pressure losses.
Pressure gauge of the 2nd stage is showing insufficient pressure.	Valve of the 1st stage is leaking.	Check the valve of the 1st stage and replace if necessary.
	Air filter very dirty.	Clean the air filter or replace it.
Pressure gauge of the 2nd stage is showing no pressure.	No power at solenoid drainage valve.	Check solenoid valve power supply.
	Solenoid valve of the drainage is faulty.	Check the solenoid valve and replace it if necessary.
Air escaping from the compressed air lines.	Connection gaskets or seals leaking.	Replace faulty gasket or seal.
	Cutting rings leaking.	Switch compressor off. Wait until all parts are no longer under pressure; check the pressure gauge for this. Tighten all fittings.
Air escaping from the overflow opening of the final separator's safety fuse.	Compressed air temperature at the outlet too high; insufficient cooling due to faulty fan.	Replace fan. Replace safety fuse.
	Cooler very dirty; insufficient ventilation.	Clean cooler. Check ventilation. Replace safety fuse.

Fault	Probable cause	Remedy
Operation with compressor control: Solenoid valve (drainage) does not close.	No power supply.	Check fuses, replace blown fuses.
	Solenoid faulty.	Replace solenoid.
	Foreign matter in solenoid valve.	Replace solenoid valve.
Abnormal compressor noise.	Connecting rod bearing faulty.	Check connecting rod bearing, replace if necessary. Check oil supply.
	Gudgeon pin bearing faulty.	Check gudgeon pin bearing, replace if necessary.
	Crankshaft bearing faulty.	Check crankshaft bearing, replace if necessary.
	Motor bearing faulty.	Check motor bearing, replace if necessary.
Oil leaking to the outside.	Gasket or shaft seal faulty. Screws not tight.	Tighten all screws. If there is **significant leakage** check to see which gasket is faulty, then replace it. **Minor traces of oil** on the crankcase or oil drops below the compressor are harmless. Wipe off with a lint-free rag.
Air escaping between the cylinder and valve cover.	Gasket or O-ring faulty.	Replace gasket or O-ring.
Oil escaping at the relief groove of the cylinder flange surface.	O-ring faulty.	Replace O-ring.
Water in oil	Incorrect ventilation (excessive cooling of compressor).	Change room ventilation.
	Poor drainage.	Check drain lines and drainage intervals.
	Insulation tube at the crankcase vent is missing or damaged.	Replace insulation tube.
	Very short compressor running time.	Extend compressor running time.
Premature fracture of valve reeds.	Poor drainage.	Check drain lines and drainage intervals. **Note:** Indentations in the gasket contact surface of the valve plate are normal.

8 Maintenance

8.1 J.P. SAUER & SOHN Maintenance Service

J.P. SAUER & SOHN Customer Service offers various maintenance services: inspection, maintenance, major overhaul, replacement compressors, and service contracts.

J.P. SAUER & SOHN Maschinenbau GmbH
Customer Service
P.O. Box 92 13
24157 Kiel, Germany

Phone (international):	
Technical information	+49 431 39 40 -87
Spare parts orders	+49 431 39 40 -86/886
Fax (international):	+49 431 39 40 -89
Emergency service (international):	+49 172 4 14 63 94
E-mail:	service@sauersohn.de
Web:	www.sauersohn.de

or contact an authorised J.P. SAUER & SOHN service partner in your area.

8.2 Maintenance safety

Before maintenance work

1. Disconnect the power supply to the compressor.
2. Put up “Attention! Maintenance work!” sign on the power supply.
3. Shut down the compressor and secure it against restarting.

Danger!

Risk of injury due to improper operation!
Only authorised persons are permitted to service and make adjustments to the Sauer compressor!

Danger!

Risk of injury from hot surfaces!
Allow compressor to cool down after shutting OFF.

Danger!

Risk of injury from pressurised components!
Check the pressure gauges before servicing to ensure the compressor is completely relieved of pressure.

Danger!

High voltage! Danger to life!

- Never assume that a circuit is de-energised – Always check for your own safety!
- The main switch is energised, even when it is turned off.
- Components being worked on must only be energised if this is explicitly specified.

Danger!

Danger of death from missing protective equipment and missing guards!
Reinstall all protective equipment and guards after servicing.
This also applies to electrical protection devices.

8.3 Maintenance schedule

Danger!

For all maintenance work Chapter 8.4 “Table of tightening torques” must be observed for certain screws/bolts.

Note!

The maintenance intervals specified in the maintenance schedule must be adhered to. Shortening maintenance intervals is of no advantage with regard to operating performance or service life of the Sauer compressor.

Note!

After the last maintenance stage the maintenance schedule begins all over again.

Instructions for the maintenance schedule

- Use the maintenance schedule as a master template or copy the respective page from the document and save it as a separate file under a suitable name. Use the maintenance schedule as a guide and as a record of work completed.
- Regularly check the maintenance schedule to see which maintenance intervals, must be kept, depending upon the number of operation hours. The intervals are shown in the table’s column headers.
- Check the column of each maintenance interval to see what maintenance work is to be carried out at the end of each maintenance interval. The required tasks are indicated by check boxes. The description for tasks are shown in the first column.
- **Carry out** all maintenance work for an interval and **tick** the appropriate check boxes of the maintenance schedule. Then **enter** operation hours, date and your signature.
- When beginning a new maintenance schedule
  - **Enter**: number of maintenance schedule, current date and operation hours count, main specifications, date of commissioning.
  - **Mark with an “X”**: Maintenance schedule beginning after commissioning or after last maintenance stage.

Maintenance schedule No.:	
Maintenance schedule beginning:	
☐ After commissioning ☐ after last maintenance stage	
Date:	
Operation hours:	

Compressor type:	WP33L
Type series	2L
Compressor number:	
Factory No.:	
Year of construction:	
Date of commissioning:	

Interval [Operation hours] **Maintenance routine**	**50 h after commissioning**	**50 h after last maintenance stage or repair**	**At least annually if < 1,000 h**	**1,000 h**	**2,000 h**	**3,000 h**	**4,000 h**
Maintenance kit part no.				**069 133**	**069 134**	**069 133**	**069 135**
Checking screw connections	☐	☐					
Cleaning the air filter			☐	☐	☐	☐	☐
Change oil	☐	☐	☐	☐	☐	☐	☐
Checking 1st stage valves				☐		☐	
Checking 2nd stage valves				☐		☐	
Replace 1st stage valves					☐		☐
Replace 2nd stage valves					☐		☐
Replace the piston rings, gudgeon pins and 1st stage gudgeon pin bearings							☐
Replace the piston rings, gudgeon pins and 2nd stage gudgeon pin bearings							☐
Checking pistons and cylinders							☐
Replacing the coupling flexible insert							☐
Checking the separator							☐
Overhauling drain valves (order-related)							☐
Operating hours							
Date							
Signature (initials)							

Note!

Carry out a check **50 h after completing a maintenance routine**. Check all screws affected by maintenance to see if they are tight.

8.4 Table of tightening torques

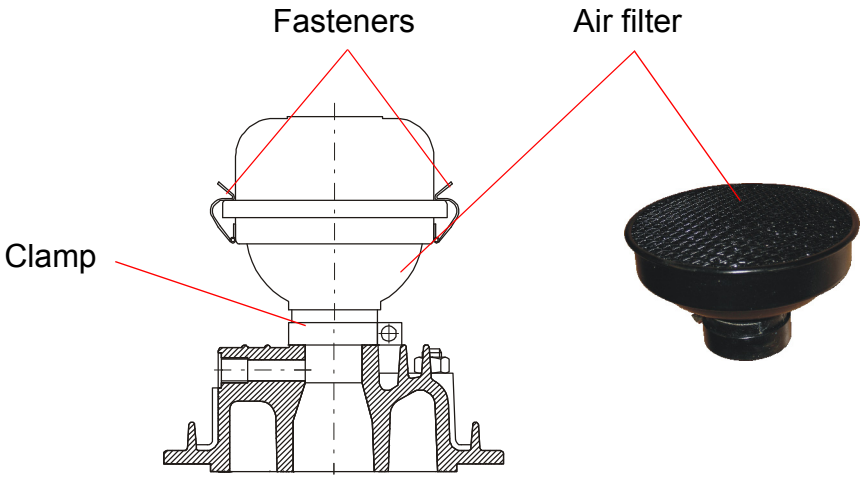
Bolts/screws	Tightening torque
Cylinder head nuts 1st stage	42 Nm
Cylinder head nuts 2nd stage	42 Nm
Connecting rod bolts 1st stage	50 Nm
Connecting rod bolts 2nd stage	50 Nm

8.5 Checking screw connections

Check all fittings and screw connections for tightness, re-tighten as necessary. This includes:

- Coolers and air lines
- Fittings for pipe lines and flexible hose lines
- Cylinder heads
- Electric motor
- Monitoring systems and switchgear
- Base frame/foundation
- Accessories and ancillary equipment

8.6 Cleaning the air filter



1. Loosen fasteners and remove the air filter cover.
2. Loosen the clamp and remove the air filter from the cylinder head.
3. Check air filter for wear and dirt.

Note!

The air filter must be replaced if it cannot be cleaned or if the air filter is damaged.

4. Rinse out air filter using a suitable solvent.

Danger!

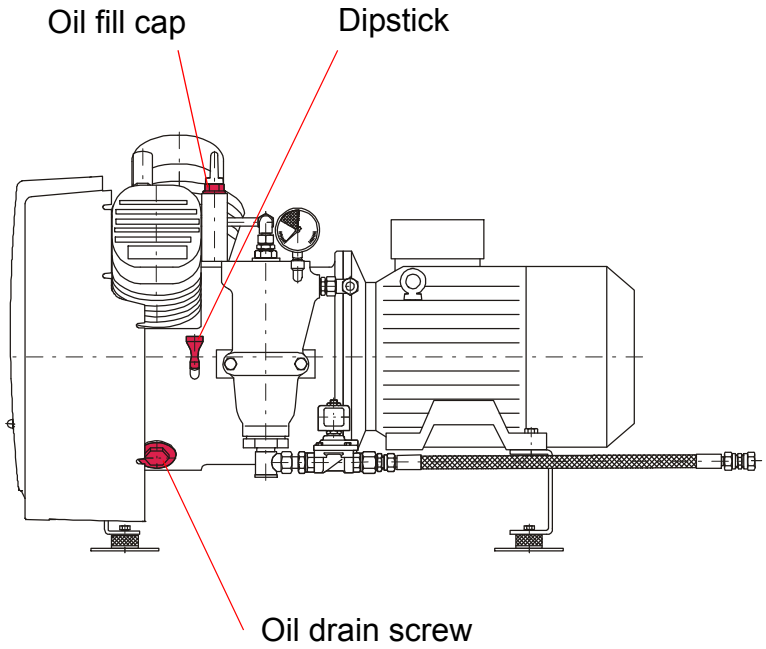
Do not point compressed air at people!

5. Blow out air filter from the inside out using compressed air.
6. Attach the clean air filter on the cylinder head and tighten the clamp.
7. Clean the cover with a lint-free cloth.
8. Attach cover and close fasteners.

8.7 Change oil

Note!

Only use oil as recommended in the lubricant table (see Sauer's oil recommendation or Operator Manual, Chapter 10).



1. Allow the compressor to run for about 5 minutes to warm up.
2. Place oil catchpan (of a size sufficient for the oil sump capacity of 1.5 litres) beneath the oil drain screw.
3. Unscrew the oil fill cap (red), unscrew the oil drain screw and pull out the dipstick.
4. Wait until all oil has drained.
5. Tighten the oil drain screw together with a new washer.
6. Pour in oil and check the filling level with the dipstick.

✓ The filling level must be between the upper and lower gauge mark on the dipstick.

7. Slide the dipstick in and screw the oil fill cap shut.

8.8 Checking valves

Removing valves

1. Disconnect the hose line of the crankcase vent from the 1st stage cylinder head.
2. Disconnect the pipe fittings on the cylinder heads.
3. Unscrew the cylinder head nuts and remove the cylinder heads.
4. Carefully remove the valves.

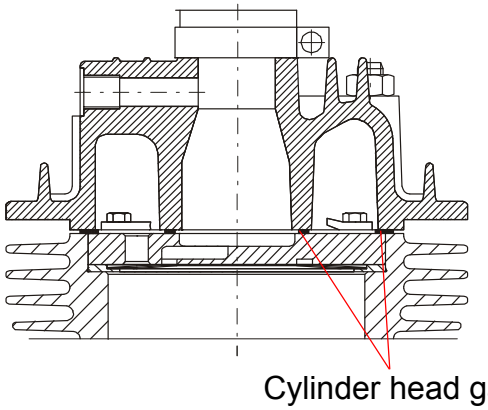
Checking valves (1st and 2nd stage)

5. Check valves for visible:
   Damage
   Coking
   Oiling
   Corrosion
   Replace damaged, heavily coked or corroded valves.
6. Clean all mating surfaces.

Valve installation

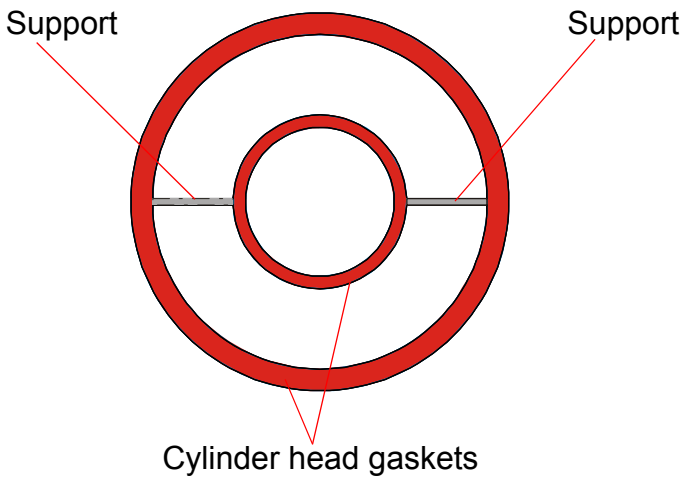
Note!

Install all valves only with new gaskets and washers. Only use genuine Sauer spare parts.
Installation of other gaskets may lead to leakage and may cause substantial damage to the compressor.



Cylinder head gasket

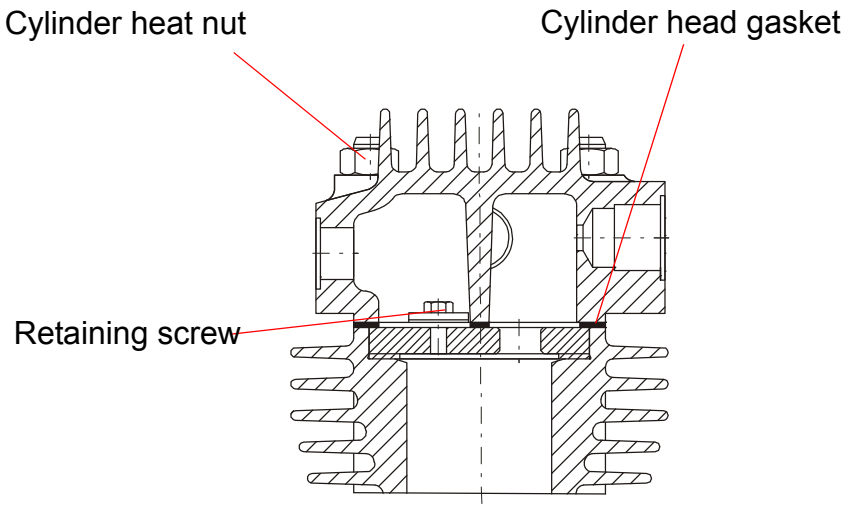
7. Insert the valve of the 1st stage.
8. Remove the supports between the inner and outer ring of the cylinder head gaskets of the 1st stage.



Note!

Use the two cylinder head gaskets together only!

9. Insert the cylinder head gaskets between the valve and the cylinder head of the 1st stage.
10. Attach cylinder head of the 1st stage and tighten all screw connections by hand.
11. Securely tighten the cylinder head nuts. Observe torque of 42 Nm (see Chapter 8.4).



12. Install the cylinder head of the 2nd stage and valve. Ensure correct installation: the retaining screw of the valve must be across from the stub of the safety valve.
13. Insert the cylinder head gasket between the valve and the cylinder head of the 2nd stage.
14. Attach cylinder head of the 2nd stage and tighten all screw connections by hand.
15. Securely tighten the cylinder head nuts. Observe torque of 42 Nm (see Chapter 8.4).
16. Screw the pipe fittings onto the cylinder heads.
17. Attach the hose lines for the crankcase vent to the cylinder head of the 1st stage.

Note!

Valves are the parts subjected to the most stress in a reciprocating compressor. In order to achieve the guaranteed maintenance intervals, these valves are high-quality precision parts, specially matched to the individual compression stages and their function carefully checked before delivery.

8.9 Replacing valves

Remove and install valves as described in Chapter 8.8 “Checking valves” . Make sure to completely replace the valves when doing this.

Note!

Valves which have reached their service life must be replaced and disposed of.
We do not recommend repairing used valves due to material fatigue.

8.10 Replace the piston rings, gudgeon pins and gudgeon pin bearings

Replacing piston rings

1. Remove valve heads and valves as described in Chapter 8.8 “Checking valves” .
2. Carefully remove the cylinder. Hold the piston while the cylinder comes off.

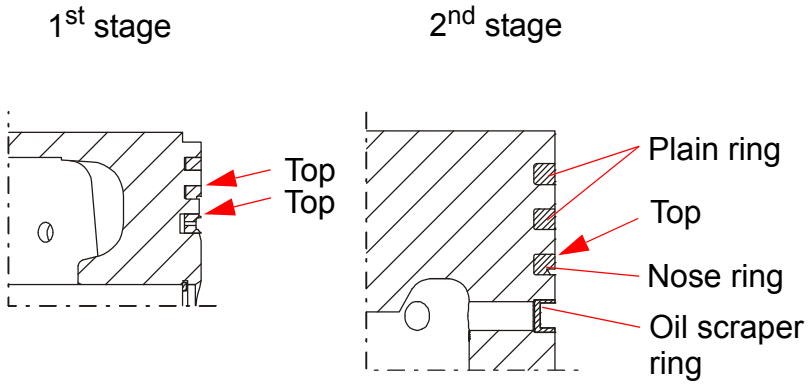
Note!

If the piston is not held while the cylinder is being pulled off, it will strike the crankcase.

3. Remove the gudgeon pin circlips, push out the gudgeon pin and remove the piston.
4. Remove all piston rings from the respective pistons and clean the pistons.
5. Install new piston rings in the respective piston. The piston ring joints must be arranged in an offset manner.
   Make sure the piston rings are in the correct position: piston rings having an asymmetric cross section are marked with “TOP” on one of the surfaces. The marked face must be at the top when the piston ring is installed (see illustration).

Note!

Always replace **all** piston rings of a piston by new ones!



Replace gudgeon pins and gudgeon pin bearings

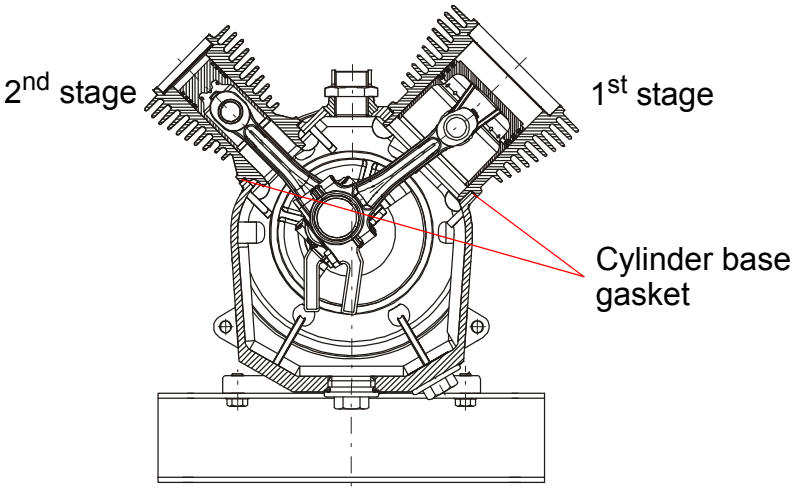
6. Press gudgeon pin bearing out of the connecting rod's small end.
7. Clean all mating surfaces.
8. Replace gudgeon pins and gudgeon pin bearings (small-end bearing).

Note!

The bore in the gudgeon pin bearing must align with the bore in the connecting rod's small end.

9. Press gudgeon pin bearing into the connecting rod's small end.

10. Insert a new cylinder foot gasket for each cylinder.



11. Slide the piston all the way to the gudgeon pin bore in each cylinder and attach the cylinder together with the piston.
12. Install the pistons to the connecting rods. To do this, press the gudgeon pin in and insert the circlips.
13. Install the cylinder heads and valves as described in Chapter 8.8 “Checking valves”.

8.11 Checking pistons and cylinders

1. Remove valve heads and valves as described in Chapter 8.8 “Checking valves”.
2. Remove the cylinder and piston as described in Chapter 8.10 “Replacing piston rings, gudgeon pins and gudgeon pin bearings”.
3. Check cylinders and pistons for scoring marks and excessive wear. Replace parts as required.

Note!

If wear edges can be felt on the piston running surface in the cylinder, these edges must be broken using a horn brush or a Scotch-Brite abrasive pad.
As otherwise the edges may damage the new piston rings when installing the piston.

4. Measure cylinders and replace if the following wear limits are exceeded:

Cylinder	Cylinder diametral wear limit
1st stage	100.15 mm
2nd stage	46.10 mm

5. Install the piston and cylinder as described in Chapter 8.10 “Replacing piston rings, gudgeon pins and gudgeon pin bearings”.
6. Install valves and cylinder heads as described in Chapter 8.8 “Checking valves”.

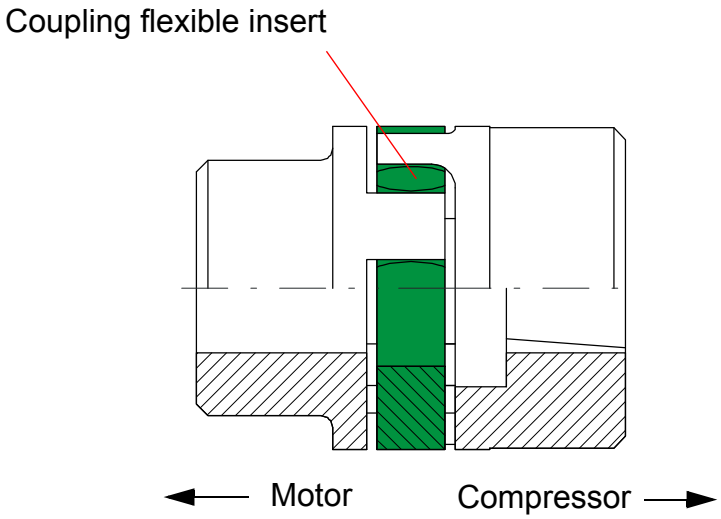
8.12 Replacing the coupling flexible insert

Visual inspection/ Removing the coupling insert

1. Shut down the compressor and secure it against restarting.
2. Support the compressor under the bell housing.
3. Unscrew fixing screws of the electric motor.
4. Lift the electric motor carefully at the lifting eye bolts (see Chapter 5.1 “Transport”)
5. Pull the electric motor carefully away from compressor.
6. Checking piston parts for damage

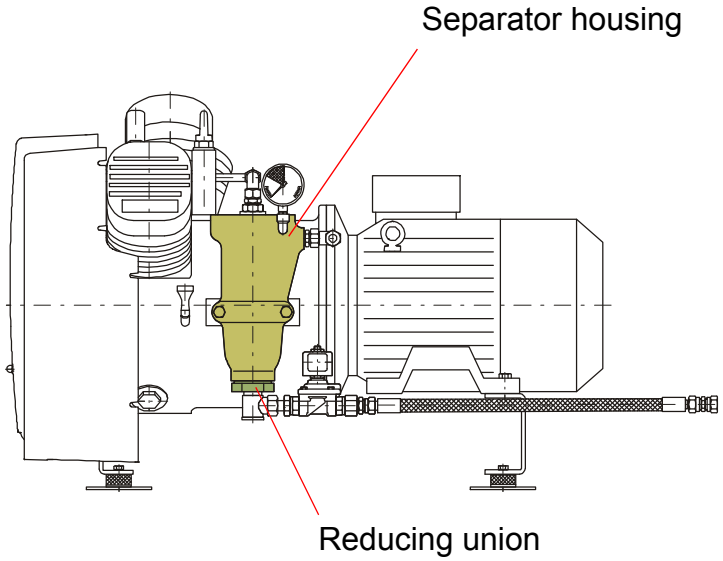
✓ The teeth of the coupling parts must not be deformed.

7. Replace coupling flexible insert.



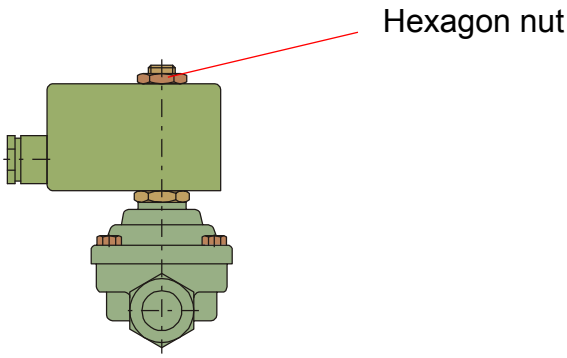
8. Carefully slide the electric motor onto the compressor and tighten the fixing screws.
9. Remove the support under the bell housing.
10. Reinstall the disconnected connecting lines and pipes.

8.13 Checking the separator



1. Shut down the compressor and secure it against restarting.
2. Disconnect the installed lines and hoses.
3. Remove the 2nd stage safety valve.
4. Remove the condensate separator from the crankcase.
5. Remove the reducing union at the bottom of the separator.
6. Pull out and check the screen.
7. Blow out screen with air.
8. Check the separator for damage.
9. Clean the separator housing with kerosene.
10. Blow out kerosene with air.
11. Assembly follows the steps in reverse order.

8.14 Overhauling the drain valve (order-related)



1. Remove hexagon nut.
2. Carefully lift the threaded portion with the screwdriver.
3. Remove coil from armature.
4. Loosen the four Allen screws.
5. Remove valve top.
6. Replace the following parts:
   Conical spring, membrane and two O-rings.
7. If heavily soiled: clean nozzle.
8. Attach valve top.
9. Tighten the four Allen screws.
10. Attach the coil onto the armature.

Note!
The coil and the armature must always be dry.

11. Position the plastic threaded portion correctly and press it onto the armature.
12. Carefully attach the hexagon nut by hand and screw on.
13. Slightly tighten the hexagon nut with a spanner.

9 Storage, Preservation – “Lay-up” procedure

9.1 Safety when storing and removing

Danger!

The compressor is only to decommissioned and disassembled by the owner's trained specialists. These specialists must be familiar with the protection devices and regulations before starting the work. Any work on the electrical installation must be carried out by qualified electricians only.

In addition, information contained in suppliers’ documentation must be observed.

9.2 Temporary decommissioning

Perform a test run for at least 30 minutes every four weeks. Additional corrosion prevention measures are not required.

When the Sauer compressor is to be laid up **for more than 12 weeks**, preservation with a preservation oil is recommended. When preservation is completed, periodic test runs are not needed.

Note!

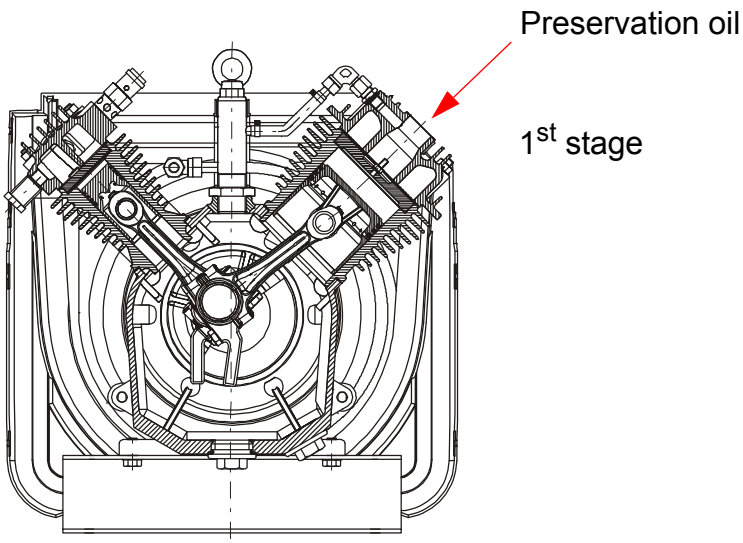
Use one of the preservation oils recommended in Chapter 10 “Lubricant Table” for corrosion protection.

The preservation oil has satisfactory running properties. In an emergency the machine can be started for a short duration when filled with preservation oil.

1. Run compressor for approx. 5 minutes with drain valves and final pressure line open.

✓ Any existing oil/water is removed.

2. Open oil drain screw, drain compressor oil and dispose of in an environmentally safe manner.
   Close oil drain screw again.
3. Fill with about 1 litres of preservation oil.
4. Start compressor and run for approx. 5 minutes with drain valves and final pressure line open.
5. Stop compressor.
6. Remove air filter on the cylinder head of the 1st stage by loosening the clamp and removing the air filter.
7. Start compressor and slowly inject approx. 15 cm^3 of preservation oil into the 1st stage intake fittings.



8. Wait until oil mist comes out of the final pressure line.
9. Stop compressor.
10. Reattach air filter.
11. Put up a sign that the compressor was preserved and taken out of service.
12. Disconnect the mains supply cables.

Putting back into service

1. Connect the mains supply cables.
2. Drain preservation oil and pour in compressor oil as described in Chapter 5.6 “Filling with Oil” .
3. Follow the instructions given in Chapter 6.3 “Initial Operation”.

9.3 Disassembly

Follow these steps for disassembly:

1. Turn compressor off and disconnect it from power supply.
2. Read the pressure gauge to ensure that the compressor is completely depressurised.
3. Disconnect the mains supply cables.
4. Remove oil and lubricants and dispose of in an environmentally safe manner.
5. Drain any remaining condensate and dispose of in an environmentally safe manner.

Disposal

Material/system component	Disposal method
Lubricants	As hazardous waste
Steel/iron	As metal scrap
Electric cables	As hazardous waste
Electronic components	As scrap electronic waste
Plastics	As hazardous waste

10 Lubricant table

Scope

The lubricant table applies to all Sauer compressors which are designed to compress air.

The lubricant table does **not** apply to

– Sauer compressors designed to compress neutral gasses;
– for temperatures outside the 5 to 55 °C range.

General recommendation

For temperatures lying within the 5 ... 55 °C range we recommend **mineral oils** meeting the **ISO VG 100** viscosity grade. At minimum, the lubricating oil should correspond to the group **VCL** as per DIN 51506.

For the following reasons, we do **not** approve the use of synthetic lubricating oils for 2-stage air-cooled compressors:

– The good water repelling characteristics of synthetic lubricating oils cause condensation of moisture in the crankcase and may lead to corrosion damage and damage to the drive.
– 2-stage air-cooled compressors are designed to run at low compression temperatures so that the high temperature stability of synthetic oils is not required.

Note!

The recommended types of oil reduce the level of coking in the compressor valves and the upstream pipe lines and fittings to a minimum.
Lubricants which are not listed in the lubricant table may only be used after approval has been given by J.P. SAUER & SOHN. Otherwise the guarantee is made void.
Please contact our Customer Service when selecting oils not listed, or if operating conditions differ from those recommended.

Note!

Unless otherwise ordered, Sauer compressors are delivered without oil.

10.1 Lubricating oils

The following mineral oils may be used in Sauer compressors; **Shell Corena P 100** mineral oil is the standard type used to fill and operate the unit.

Brand	Product name	Group
Agip	Diesel Gamma 30	VCL-100
	Dicrea 100	VDL-100
	Acer 100	VCL-100
	Motor Oil HD 30	SAE 30
	Cladium 50	SAE 30
ARAL	Kowal M30	VCL-100
AVIA	Avilub Verdichteröl VDL-100	VDL-100
BP	Energol RC 100	VDL-100
	Energol IC-DG 30	VCL-100
	Vanellus C3 SAE 30	SAE 30
	Aircol PD 100	VDL-100
CHEVRON	HD Compressor Oil 100	VDL-100
	Delo 1000 Marine 30	SAE 30
	Veritas 800 Marine 30	SAE 30
MOBIL	Rarus 427	VDL-100
	Mobilgard 300	SAE 30
	Mobilgard 312	SAE 30
	Delvac 1230	SAE 30
Shell	Corena P 100	VDL-100
	Rimula X 30	SAE 30
	Melina S Oil 30	SAE 30
	Melina Oil 30	SAE 30
	Gadinia Oil 30	SAE 30
Statoil	MARWAY 1030	SAE 30
TEXACO	Compressor Oil EP VDL 100	VDL-100
	Regal EP 100	VCL-100
	Ursatex 30	SAE 30
	Veritas 800 Marine 30	SAE 30
TOTAL	Dacnis P 100	VDL-100
	Disola M 3015	SAE 30

The following mineral oils may alternatively be used without restriction in marine applications:

Brand	Product name	Group
NATO classified	O - 278	VDL-120
NATO classified	OMD 113	VDL-100

10.2 Preservation oils

The standard oil used by Sauer for compressor preservation is **Mobilarma 524**.
Alternatively, the following preservation oils can be used:

Brand	Product name
Agip	Rustica C SAE 30
ARAL	Konit Motoröl SAE 30
AVIA	MK 1540 S
BP	MEK 20 W-20
DEA	Deamot EKM 642 SAE 30
Mobil	Mobilarma 524
Shell	Ensis Motor Oil 30

Note!
The product name may vary by country.

11 Spare Parts and Accessories

Note!

Please note the information in Chapter 1 “General” regarding our genuine Sauer spare parts.

J.P. SAUER & SOHN guarantee the complete spare parts supply over the entire service life of the Sauer compressor.

Our genuine Sauer spare parts are subject to constant quality control and further development. They conform to the latest technical developments.

In addition to genuine Sauer spare parts, our range of supply includes many accessories for your Sauer compressor as well as special equipment for your entire compressed air system, including:

– Fully automatic controls
– Adsorption dryers
– Refrigerant type dryers
– Filters
– Sound-dampening enclosures
– Compressed air vessels and
– Fittings

We supply instructions and a maintenance manual for each accessory.

Spare parts catalogue

The spare parts catalogue is in the Appendix to this Operator Manual.

– The required parts can be quickly found with the help of diagrams, illustrations and lists.
– The spare parts catalogue and Operator Manual are also available on CD-ROM. This makes it easy to fill out an order form, print it out and send it in immediately.
  To do so, you need the **main specifications** of your Sauer compressor from the table below. If the data has not yet been entered, it can be found on the nameplate affixed to the crankcase.

Compressor type:					
Factory No.:					
Year of construction:					

You should additionally indicate the **number of operating hours**.

12 Appendix

This Appendix to the Operator Manual contains

- Form for commissioning certificate
- Form for Return of Goods/Notification of Claim
- Supplier documentation
- Data sheets

Commissioning certificate for compressors

J.P. SAUER & SOHN
Maschinenbau GmbH
Brauner Berg 15 - 24159 Kiel
Phone: +49 - 431- 39 40 - 0
Fax: +49 - 431- 39 40 - 89
E-mail:service@sauersohn.de

Purchaser		**Owner**	**Installation site**
Company		Company	
Street		Street	
Postcode		Postcode	
Contact		Contact	
Phone number		Phone number	
Customer number			
Order number			
Compressor type		Serial No.	
Delivery date		Operating hours	
Date commissioned			

Sauer service engineer	Company/name
	Company/name
	Company/name
	Company/name

Installation of compressor/complete system ☐ Good ☐ Faults		Check of rotational direction	
		Compression temperature	°C
Ventilation ☐ Good ☐ Faults		Suction temperature	°C
		Start/stop pressure	
Ambient conditions ☐ Good ☐ Faults		Oil level check	
		Control system check	
Voltage? ☐ Good ☐ Faults		Test run	
Vibration behaviour of compressor ☐ Good ☐ Faults			

Accessories	Installation of complete system carried out by:	
Compressed air vessel		
Refrigerant type dryer		
Adsorption dryer	☐ Good	☐ Faults
Filter		
Condensate removal		

Operating personnel have received instruction and are familiar with the safety and maintenance requirements.
The maintenance instructions are available to the owner.
The operating company has been advised to use only genuine SAUER & SOHN spare parts.

Notes/faults:

The system has been accepted by the owner. City: Date:

Purchaser Owner Authorised Sauer Service Partner

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☐ **Return of goods**
☐ **Notification of claim**

Date:

J.P. SAUER & SOHN
Maschinenbau GmbH
Brauner Berg 15 - 24159 Kiel, Germany
Phone: +49 - 431- 39 40 - 0
Fax: +49 - 431- 39 40 - 89
E-mail: service@sauersohn.de

To be completed by manufacturer

Manufacturer:
Company
Street
Postcode/City
Customer No.
Location

End customer:
Company
Street
Postcode/City
Customer No.
Location

Please always complete.
Compressor type:

Serial No.:

Operation hours:

Date of fault:

Ambient temperature:

Spare parts

Designation	Quantity	Part No.

Reason for return

- Report on fault ☐
- Repair ☐
- Checking as customer service ☐
- Goods taken back against credit note ☐

Short description of fault:

To be completed by manufacturer only

Report

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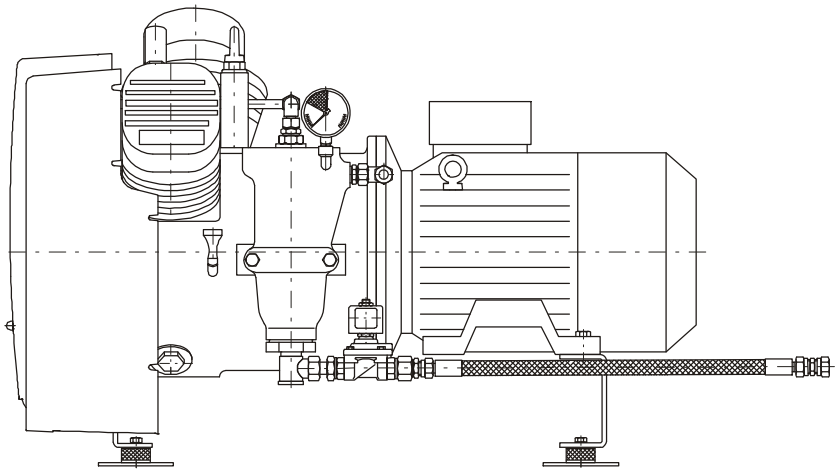
J.P. SAUER & SOHN
MASCHINENBAU GMBH



Sauer Compressor

Type: WP 33 L

Spare parts catalogue

Ein Mitglied der
SAUER-Gruppe

Edition: 12 / 2010
Edited by: J.P. Sauer & Sohn Maschinenbau – Technical Documentation

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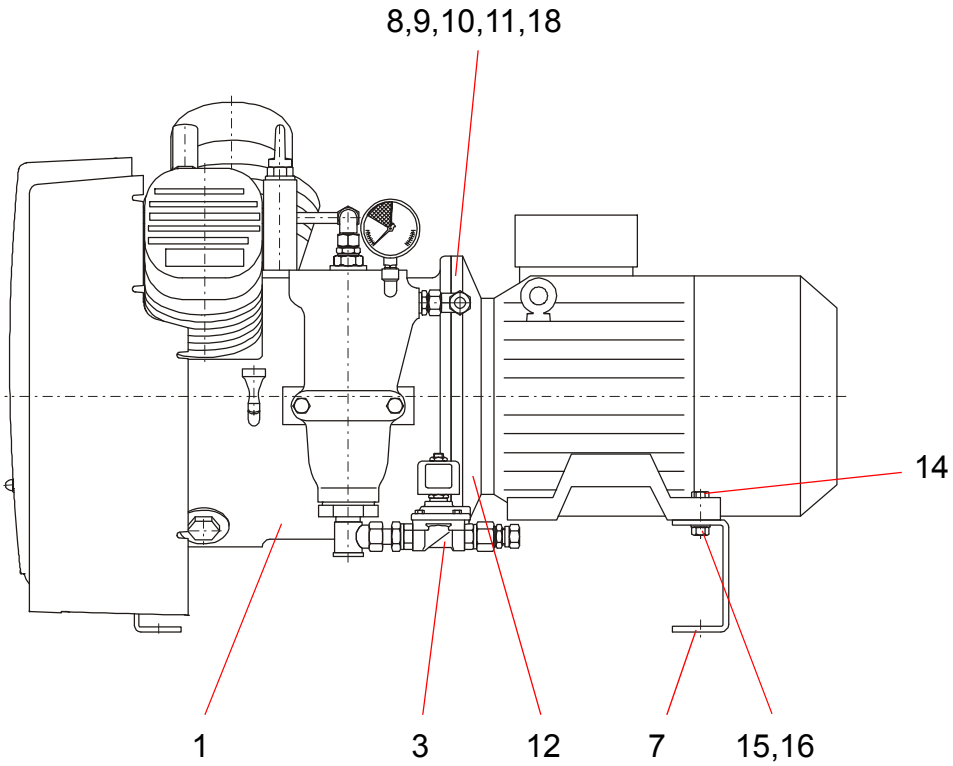
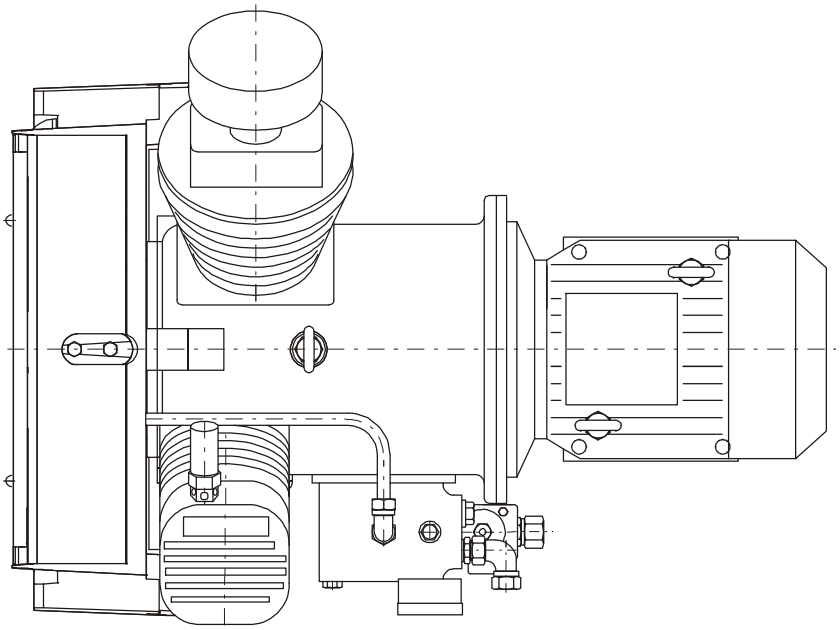
065 567 Compressor unit WP 33L

Note:

Explanation of the assemblies in Chapter 3 “Design and Function” in this Operator Manual.

065 567 Compressor unit WP 33L



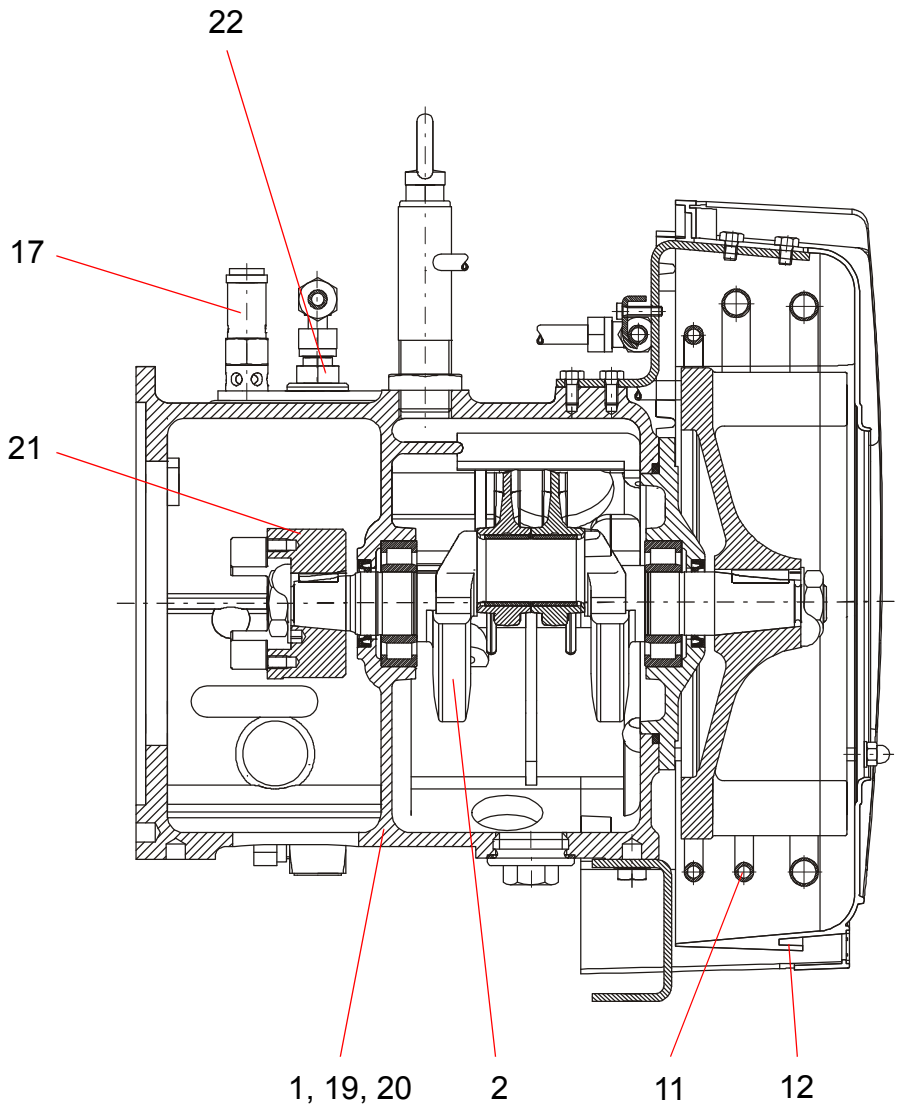


065 567 Compressor unit WP 33L

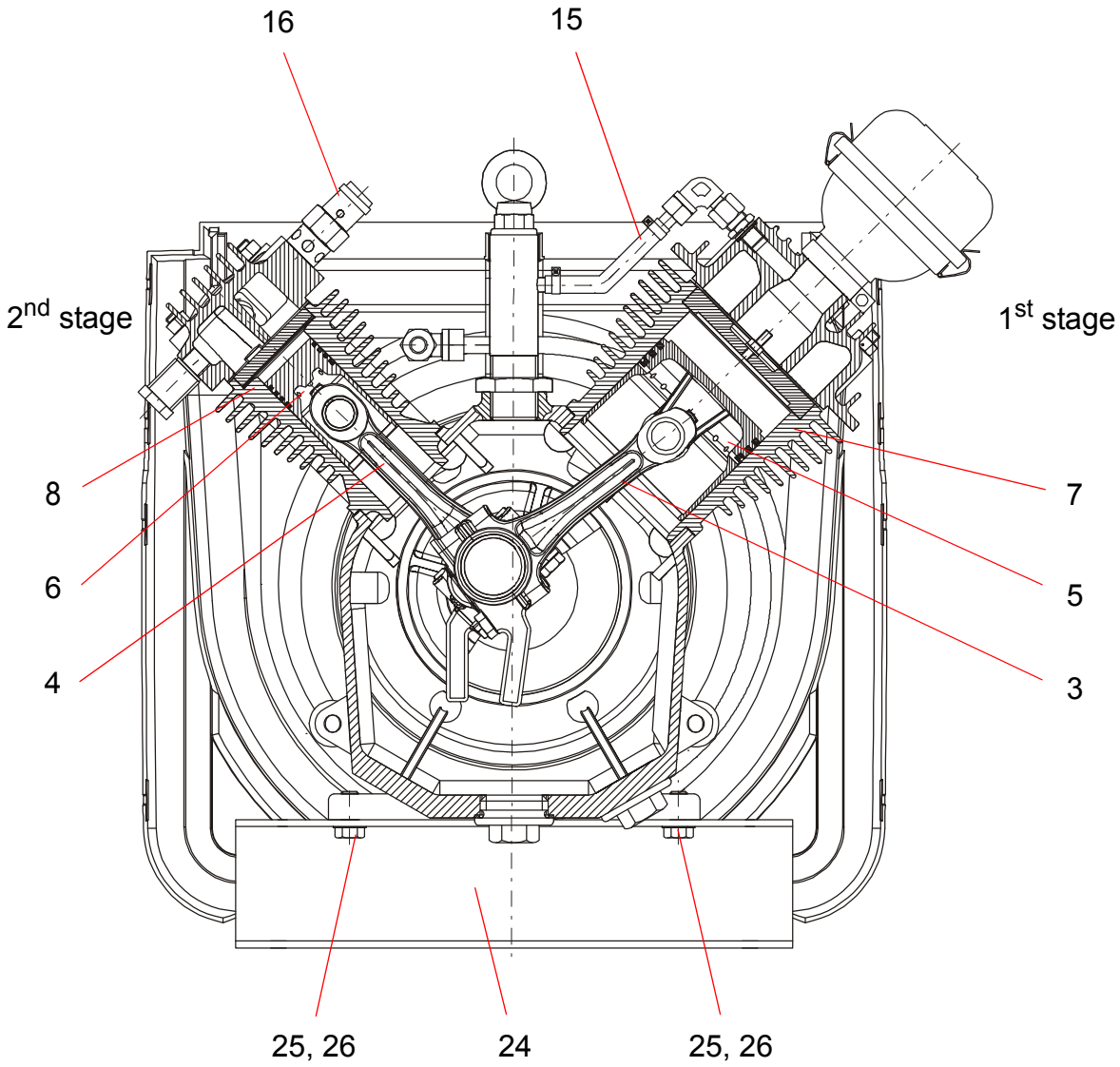
Item No.	Ref. No.	Designation	Quantity
1	060 315	Compressor WP 33L	1
3	060 354	Automatic drainage system	1
7	065 569	Compressor base	1
8	060 441	Spacer ring	1
9	035 318	Motor half coupling	1
10	033 637	Coupling flexible insert	1
11	[1]	AC motor	1
12	000 150	Hexagon head screw	2
14	000 043	Hexagon head screw	2
15	002 031	Hexagon nut	2
16	002 157	Washer	2
18	012 851	Hexagon head screw	2

[1] The order number for the AC motor is order-specific.

060 315 Compressor WP 33L



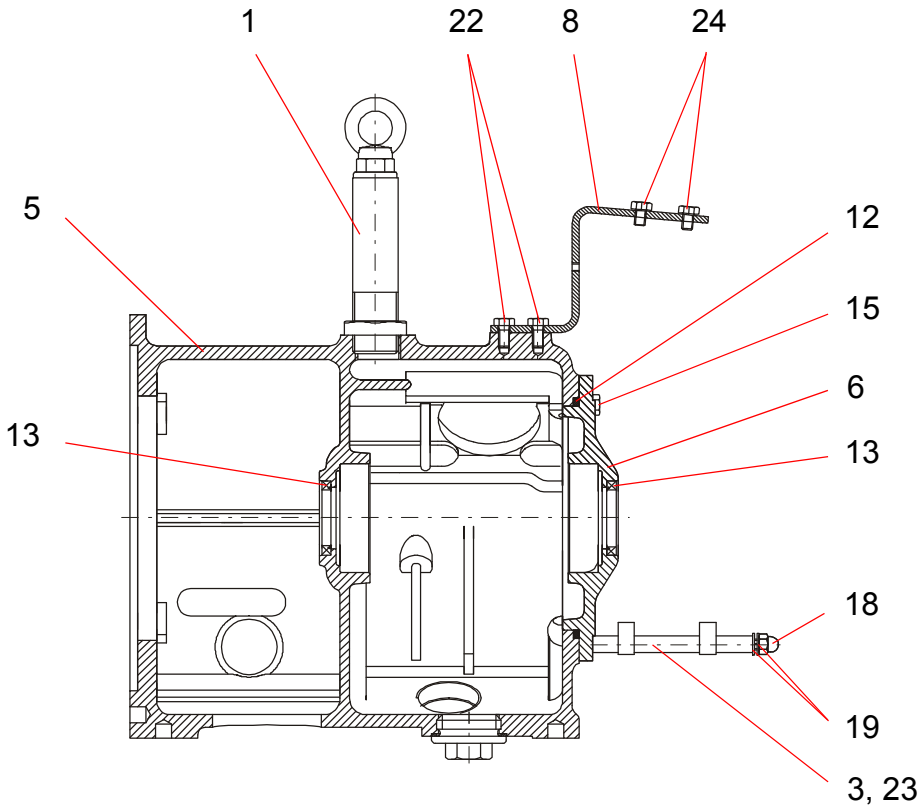
060 315 Compressor WP 33L

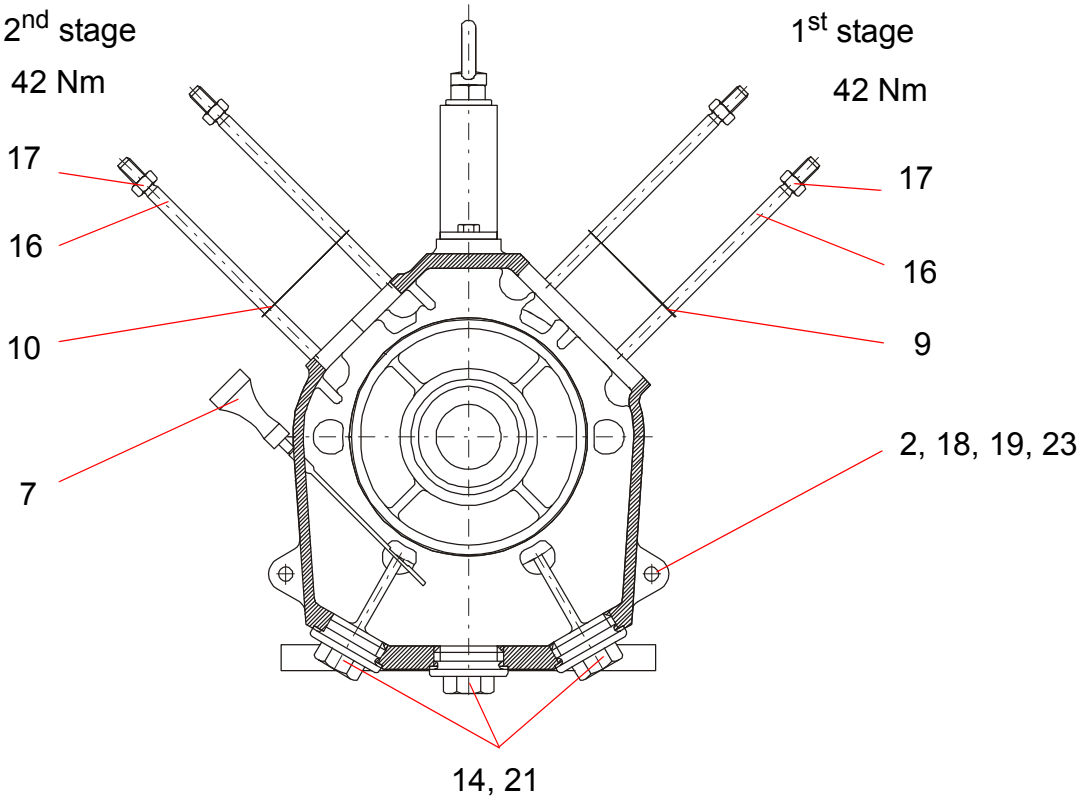


060 315 Compressor WP 33L

Item No.	Ref. No.	Designation	Quantity
1	060 316	Crankcase	1
2	060 317	Crankshaft	1
3	060 280	Connecting rod 1st stage	1
4	060 283	Connecting rod 2nd stage	1
5	034 989	Piston 1st stage	1
6	060 319	Piston 2nd stage	1
7	068 628	Cylinder with head and valve 1st stage	1
8	068 615	Cylinder with head and valve 2nd stage	1
11	060 322	Cooler	1
12	090 336	Fan cover	1
15	060 328	Vent line	1
16	030 915	Safety valve 1st stage	1
17	030 752	Safety valve 2nd stage	1
19	050 643	Nameplate	1
20	004 408	Locking pin	4
21	035 316	Compressor half coupling	1
22	060 440	Air line	1
24	060 437	Compressor base	1
25	000 054	Hexagon head screw	2
26	031 057	Lock washer	2

060 316 Crankcase





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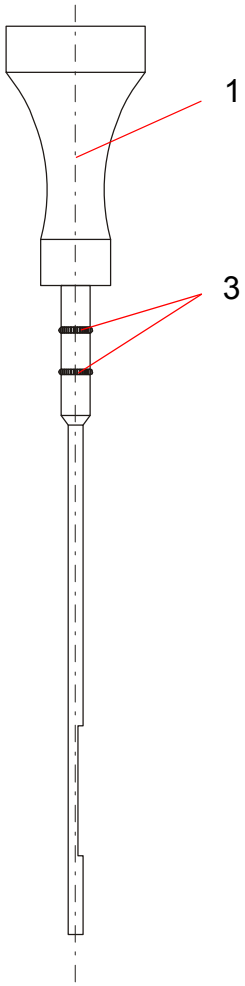
060 316 Crankcase

Item No.	Ref. No.	Designation	Quantity
1	060 376	Vent stub	1
2	054 816	Stud bolt	1
3	054 817	Stud bolt	1
5	060 406	Crankcase	1
6	060 409	Bearing housing	1
7	061 383	Dipstick	1
8	060 425	Support plate	1
9	060 448	Gasket	1
10	060 449	Gasket	1
12	031 103	O-ring	1
13	001 884	Shaft seal	2
14	001 021	Plug	3
15	005 247	Hexagon head screw	6
16	035 032	Stud screw	8
17	002 031	Hexagon nut	8
18	002 361	Cap nut	2
19	002 153	Washer	4
21	005 029	Washer	3
22	000 026	Hexagon head screw	2
23	001 620	Hexagon nut	2
24	034 228	Screw	2

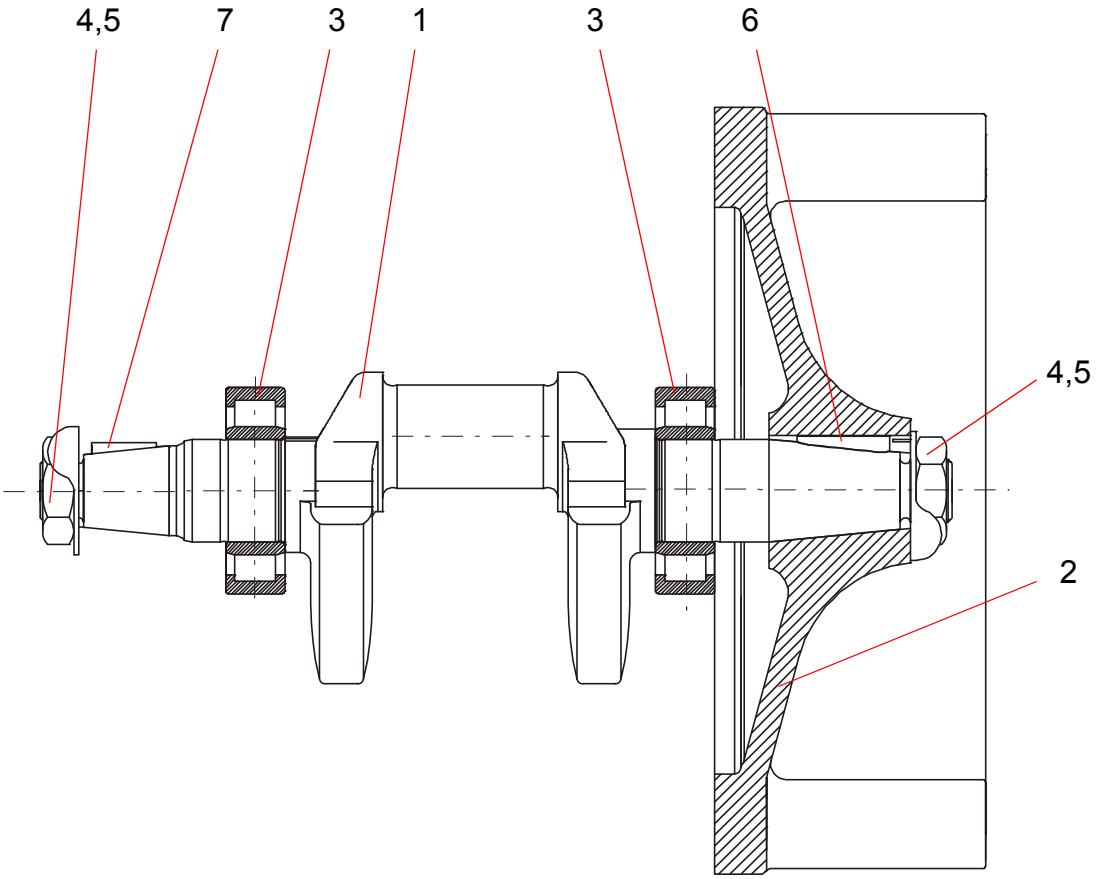
061 383 Dipstick



061 383 Dipstick

Item No.	Ref. No.	Designation	Quantity
1	035 605	Dipstick	1
3	035 528	O-ring	2

060 317 Crankshaft



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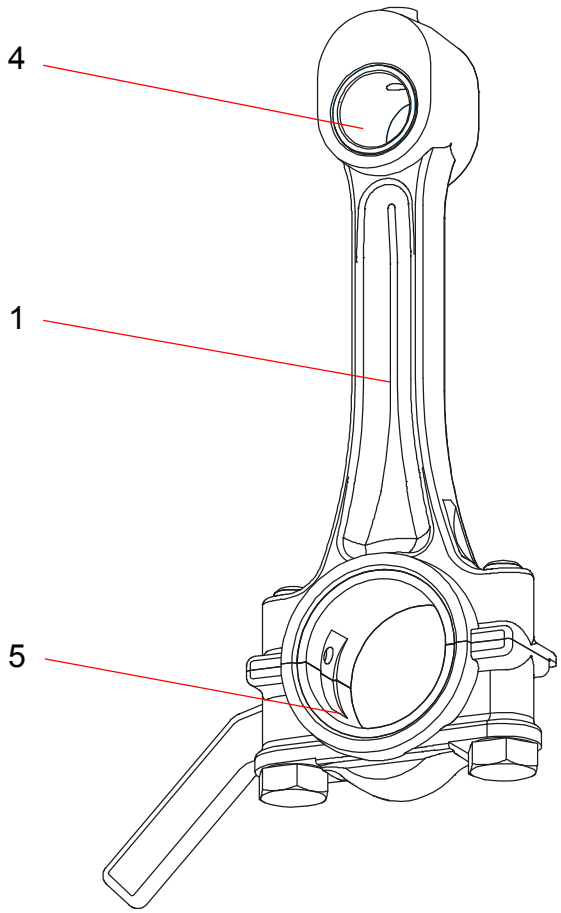
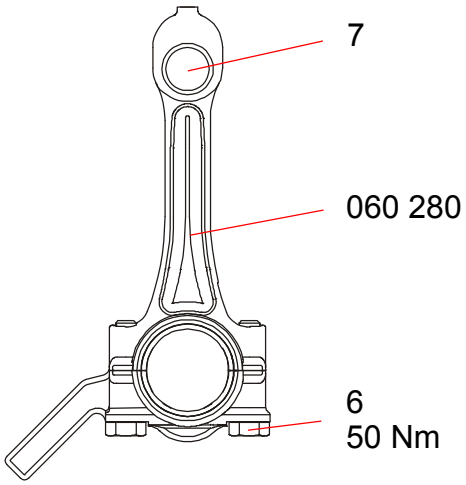
060 317 Crankshaft

Item No.	Ref. No.	Designation	Quantity
1	060 325	Crankshaft	1
2	050 510	Fan wheel/flywheel	1
3	035 026	Cylindrical roller bearing	2
4	001 096	Hexagon nut	2
5	001 691	Lock plate	2
6	001 984	Feather key	1
7	001 981	Feather key	1

060 280 Connecting rod 1st stage





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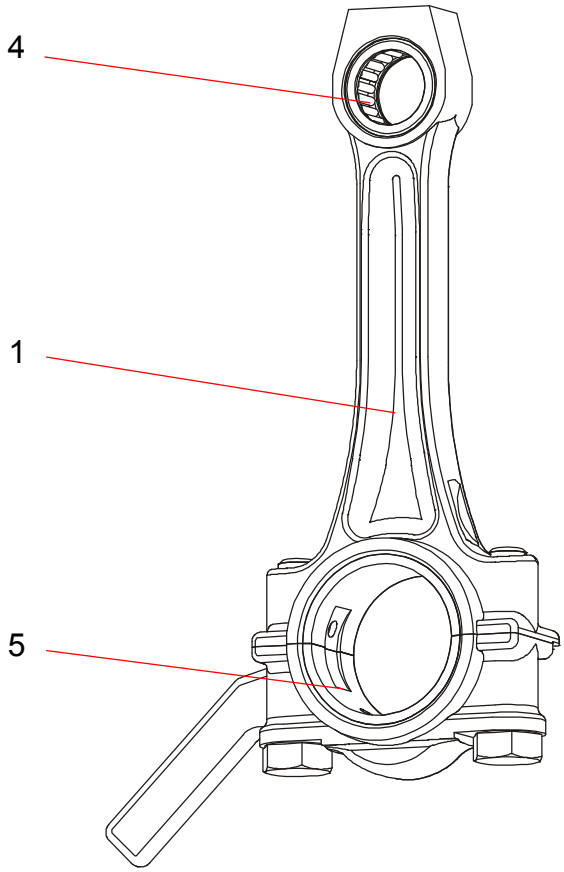
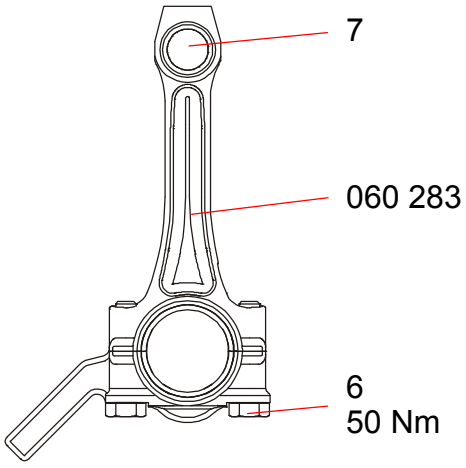
060 280 Connecting rod 1st stage

Item No.	Ref. No.	Designation	Quantity
1	060 274	Connecting rod	1
4	050 519	Gudgeon pin bush	1
5	050 520	Connecting rod bearing	1
6[1)]	050 459	Connecting rod bolt	2
7[2)]	032 117	Gudgeon pin	1

[1)] Item 6, Connecting rod bolt 050 459 is part of assembly 060 274.
[2)] Item 7, 032 117 Gudgeon pin is part of assembly 034 989.

060 283 Connecting rod 2nd stage





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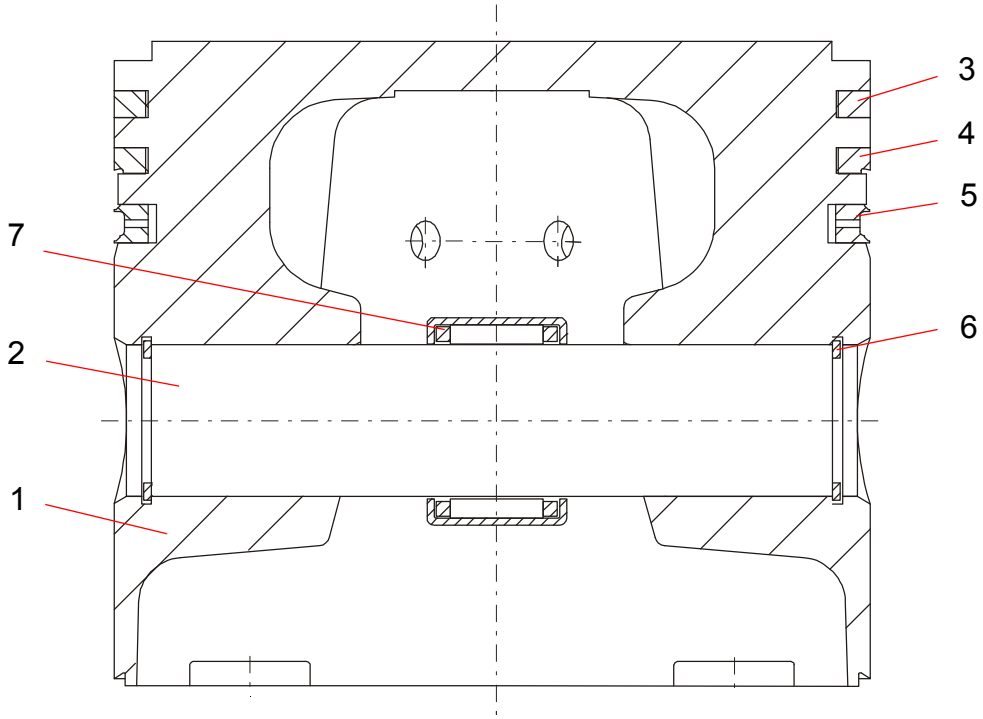
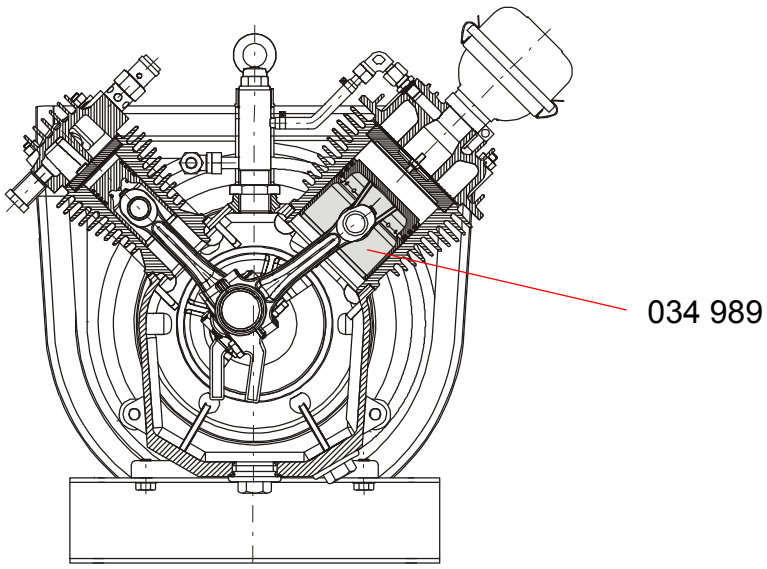
060 283 Connecting rod 2nd stage

Item No.	Ref. No.	Designation	Quantity
1	060 277	Connecting rod	1
4	039 029	Needle sleeve	1
5	050 520	Connecting rod bearing	1
6[1)]	050 459	Connecting rod bolt	2
7[2)]	050 585	Gudgeon pin	1

[1)] Item 6, Connecting rod bolt 050 459 is part of assembly 060 277.
[2)] Item 7, 050 585 Gudgeon pin is part of assembly 060 319.

034 989 Piston 1st stage





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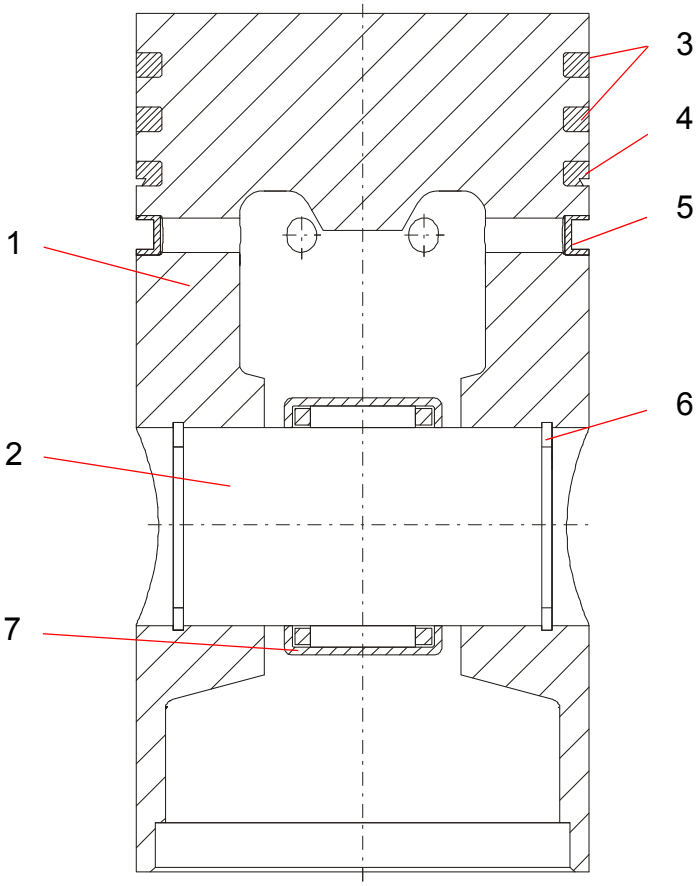
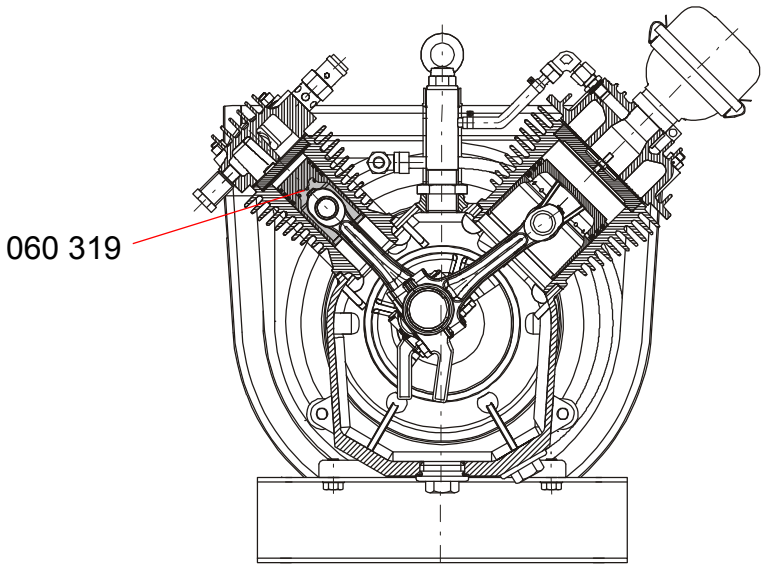
034 989 Piston 1st stage

Item No.	Ref. No.	Designation	Quantity
1		Piston	1
2	032 117	Gudgeon pin	1
3	002 755	Plain ring	1
4	002 563	Nose ring	1
5	034 988	Oil scraper ring	1
6	002 973	Circlip	2
7[1)]	050 519	Gudgeon pin bush	1

[1)] Item 7, Connecting gudgeon pin bush 050 519 is part of assembly 060 280.

060 319 Piston 2nd stage





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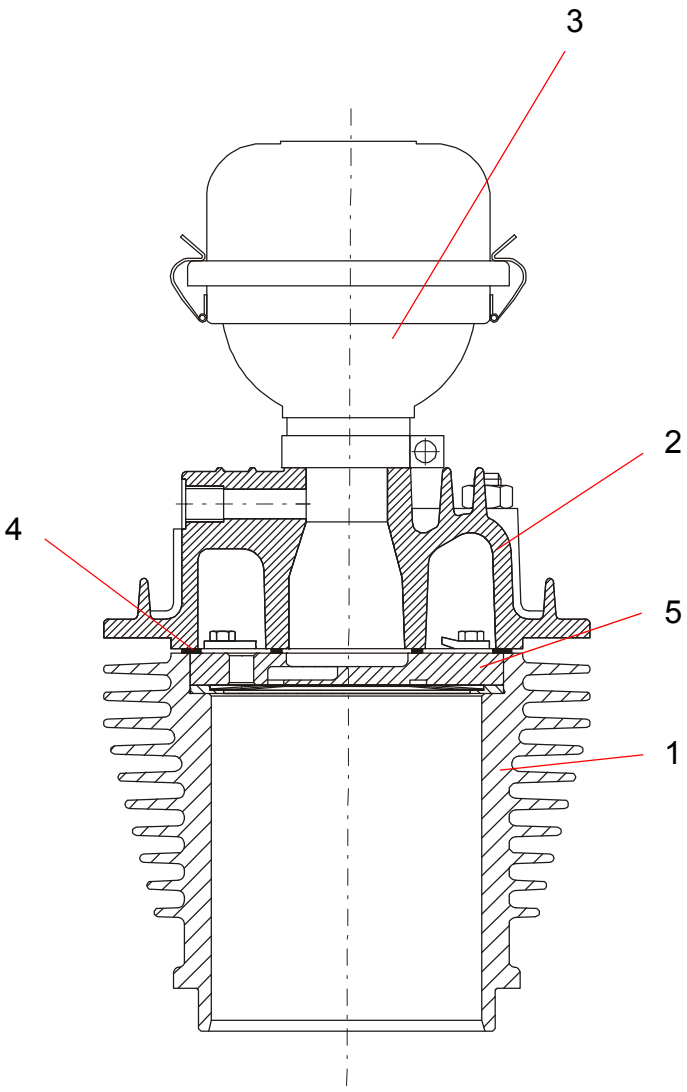
060 319 Piston 2nd stage

Item No.	Ref. No.	Designation	Quantity
1	060 355	Piston	1
2	050 585	Gudgeon pin	1
3	002 662	Plain ring	2
4	002 543	Nose ring	1
5	002 576	Oil scraper ring	1
6	002 973	Circlip	2
7[1)]	039 029	Needle sleeve	1

[1)] Item 7, Needle sleeve 039 029 is part of assembly 060 281.

068 628 Cylinder with head and valve 1st stage



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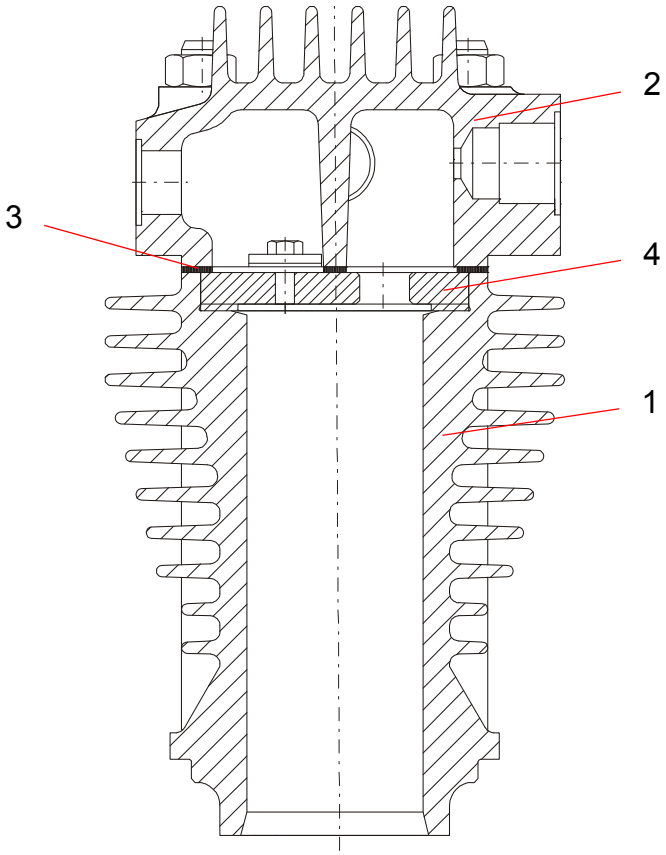
068 628 Cylinder with head and valve 1st stage

Item No.	Ref. No.	Designation	Quantity
1	060 304	Cylinder	1
2	060 300	Cylinder head	1
3[1)]	030 113	Air filter	1
4	060 266	Gasket	1
5	034 983	Lamellar valve 1st stage	1

[1)] Fastening clamp is part of item 3, 030 113 air filters.

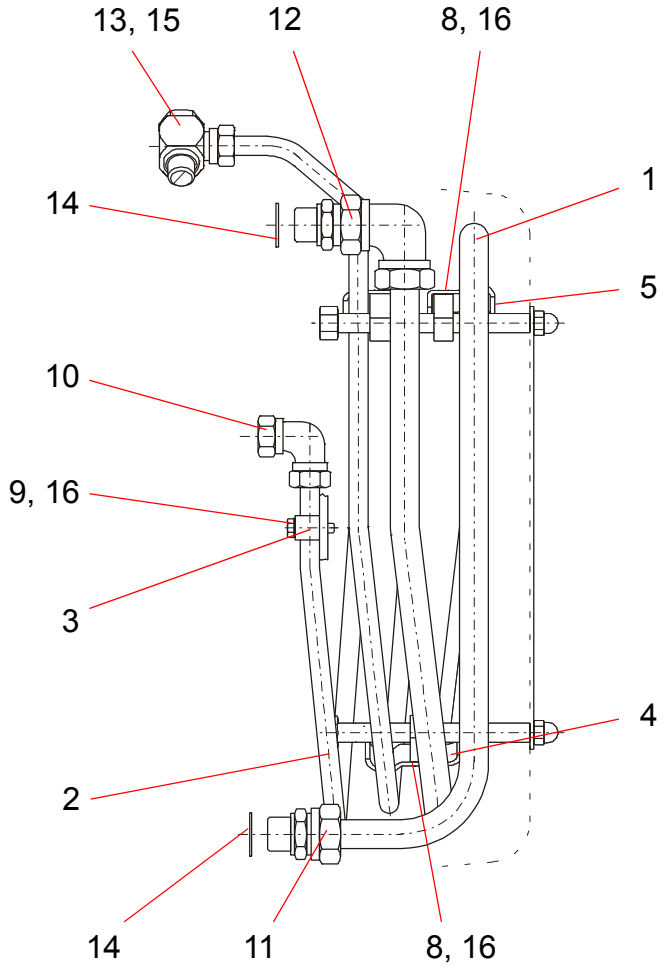
068 615 Cylinder with head and valve 2nd stage

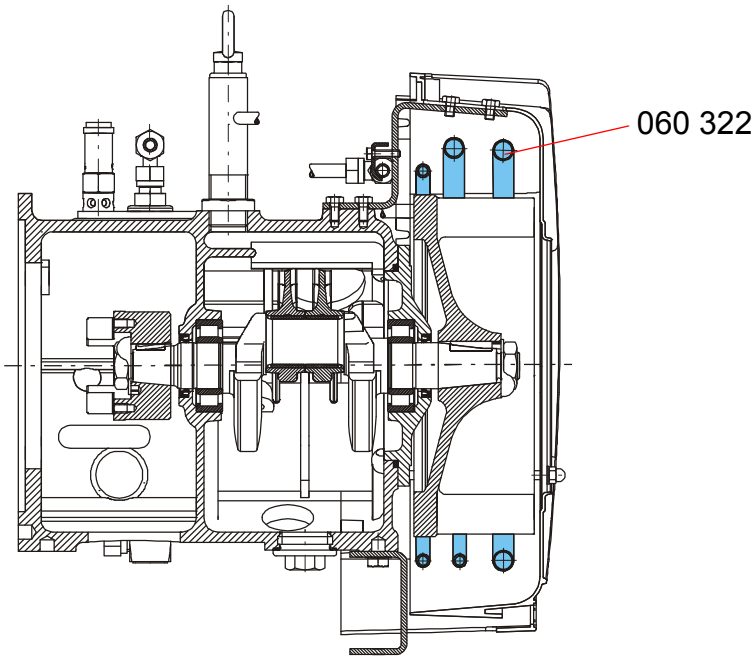


068 615 Cylinder with head and valve 2nd stage

Item No.	Ref. No.	Designation	Quantity
1	060 302	Cylinder	1
2	060 267	Cylinder head	1
3	060 264	Gasket	1
4	034 984	Lamellar valve 2nd stage	1

060 322 Cooler





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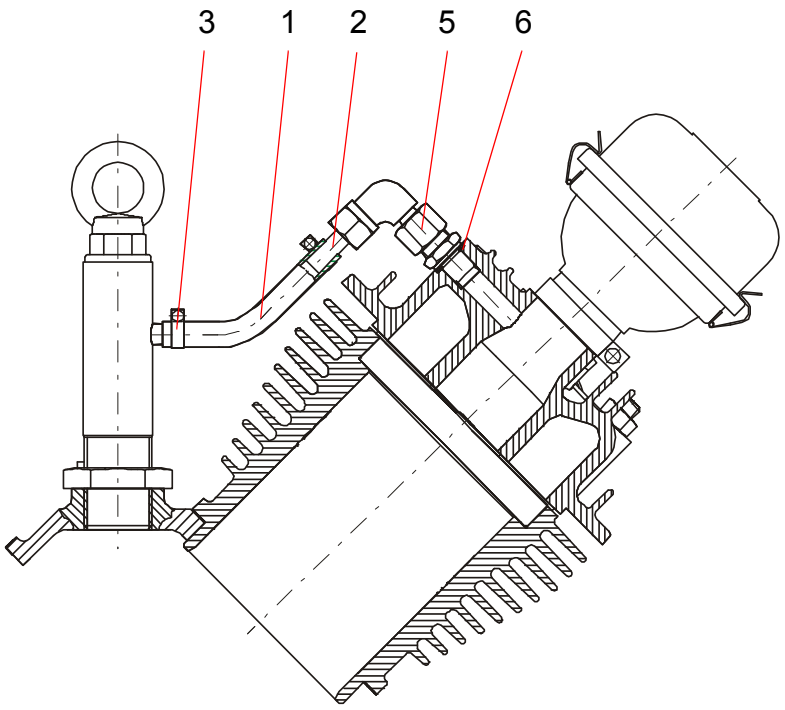
060 322 Cooler

Item No.	Ref. No.	Designation	Quantity
1	050 545	Cooler 1st stage	1
2	060 323	Cooler 2nd stage	1
3	050 547	Clamp	2
4	050 548	Clamp	1
5	050 549	Clamp	1
8	000 015	Hexagon head screw	3
9	012 728	Hexagon head screw	1
10	004 993	Fitting	1
11	004 647	Fitting	1
12	006 219	Fitting	1
13	006 183	Fitting	1
14	005 009	Washer	2
15	005 006	Washer	1
16	003 113	Lock washer	4

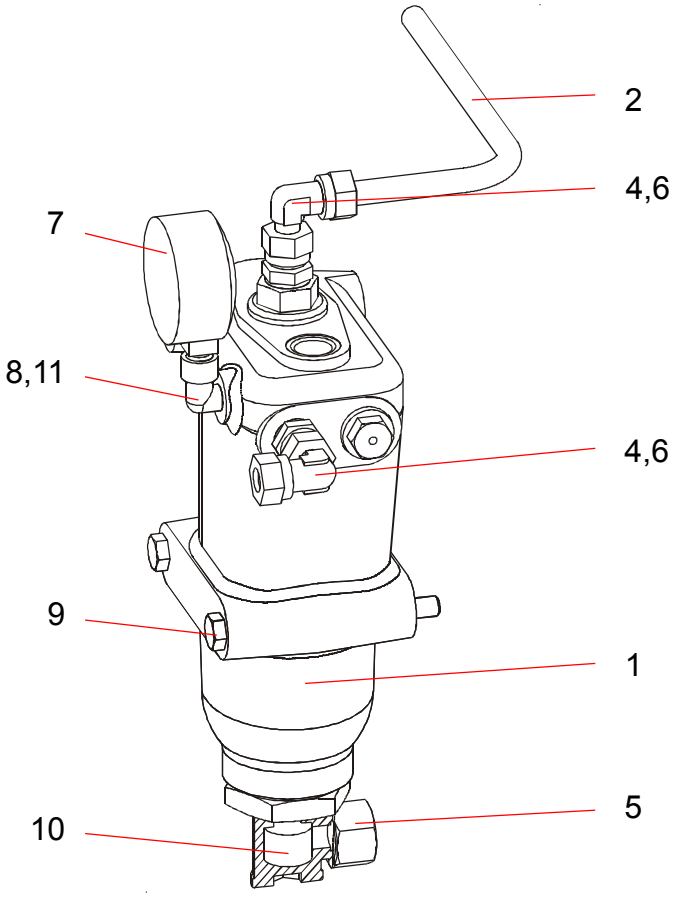
060 328 Vent line

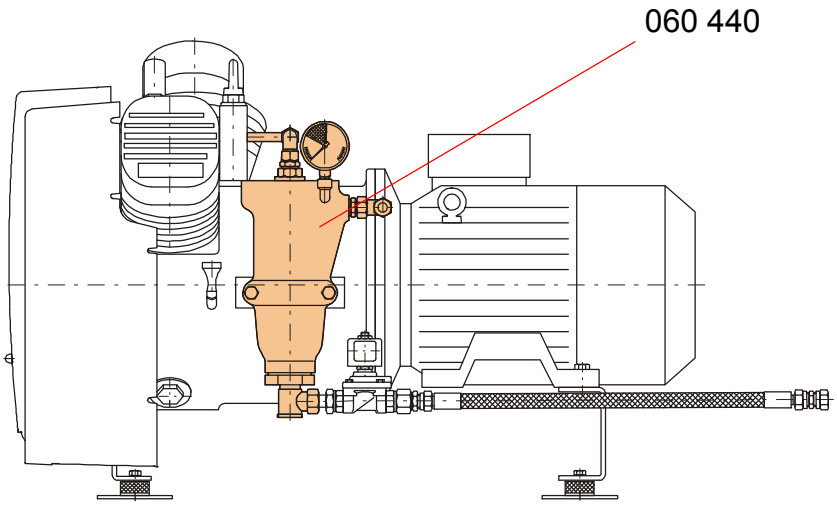


060 328 Vent line

Item No.	Ref. No.	Designation	Quantity
1	035 007	Low-pressure hose	1
2	008 646	Pipe	1
3	035 254	Worm drive hose clip	2
5	006 205	Fitting	1
6	005 001	Washer	1

060 440 Air line





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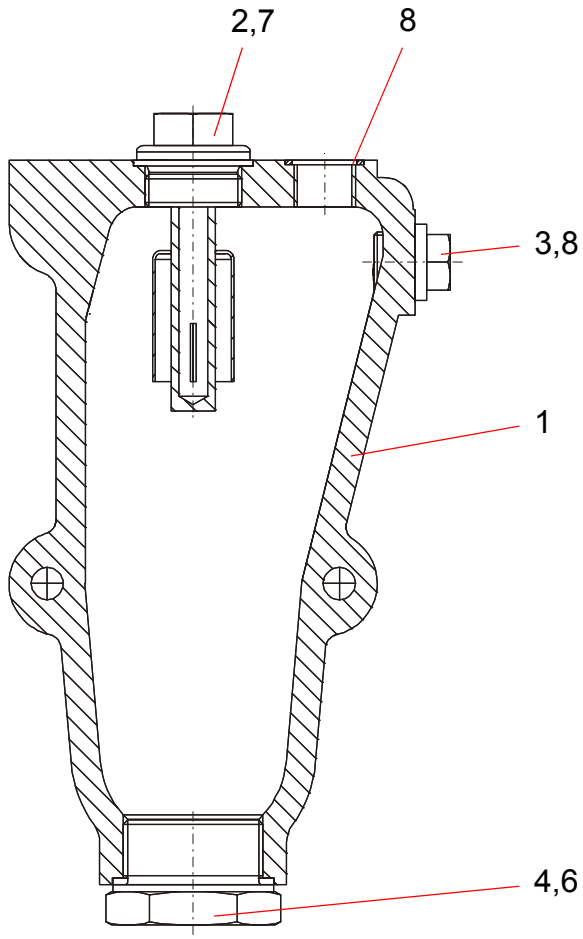
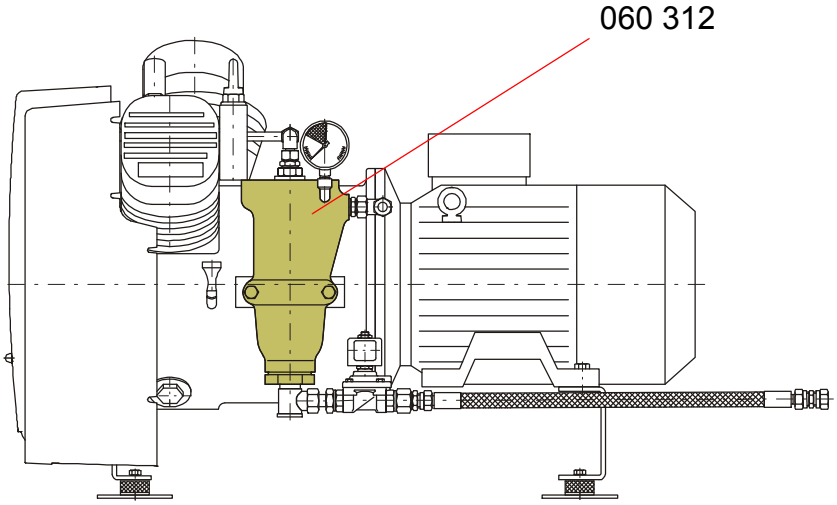
060 440 Air line

Item No.	Ref. No.	Designation	Quantity
1	060 312	Separator	1
2	060 444	Pipe	1
4	006 212	Fitting	2
5	006 187	Fitting	1
6	005 006	Washer	2
7	038 282	Pressure gauge	1
8	035 061	Washer	1
9	004 750	Hexagon head screw	2
10	035 426	Cylinder filter	1
11	038 264	Pressure gauge angle piece	1

060 312 Separator





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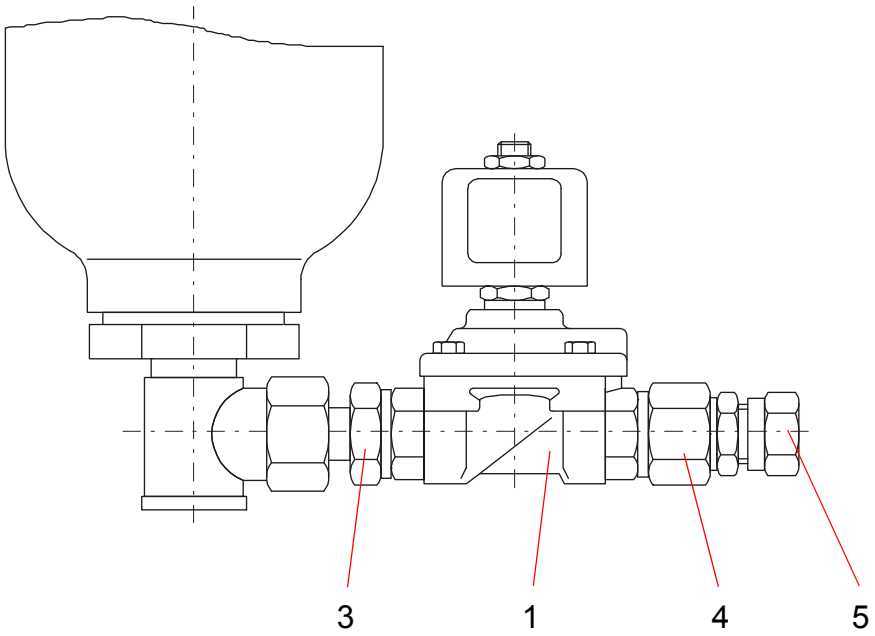
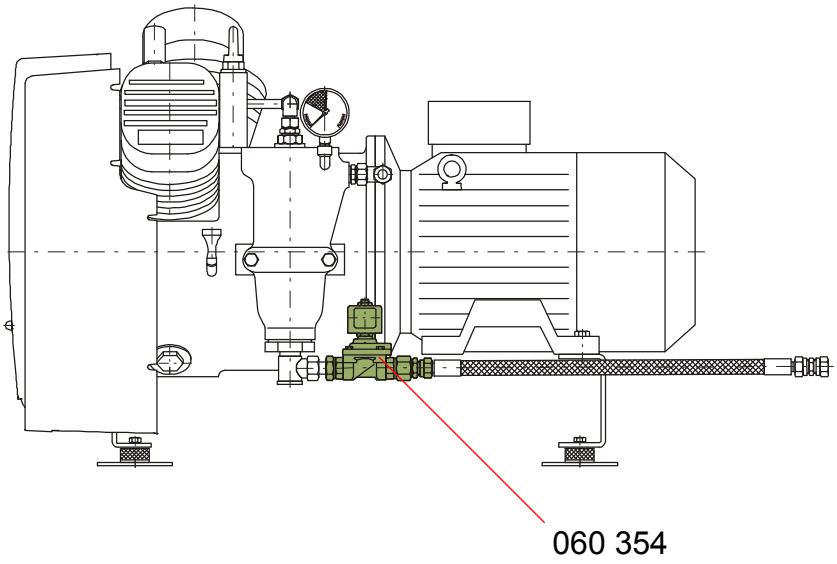
060 312 Separator

Item No.	Ref. No.	Designation	Quantity
1	060 311	Separator housing	1
2	060 340	Deflecting pipe	1
3[1)]	060 342	Fusible plug	1
4	006 390	Reducing union	1
6	005 029	Washer	1
7	005 023	Washer	1
8	005 009	Washer	2

[1)] 121 °C / 250 °F

060 354 Automatic drainage system





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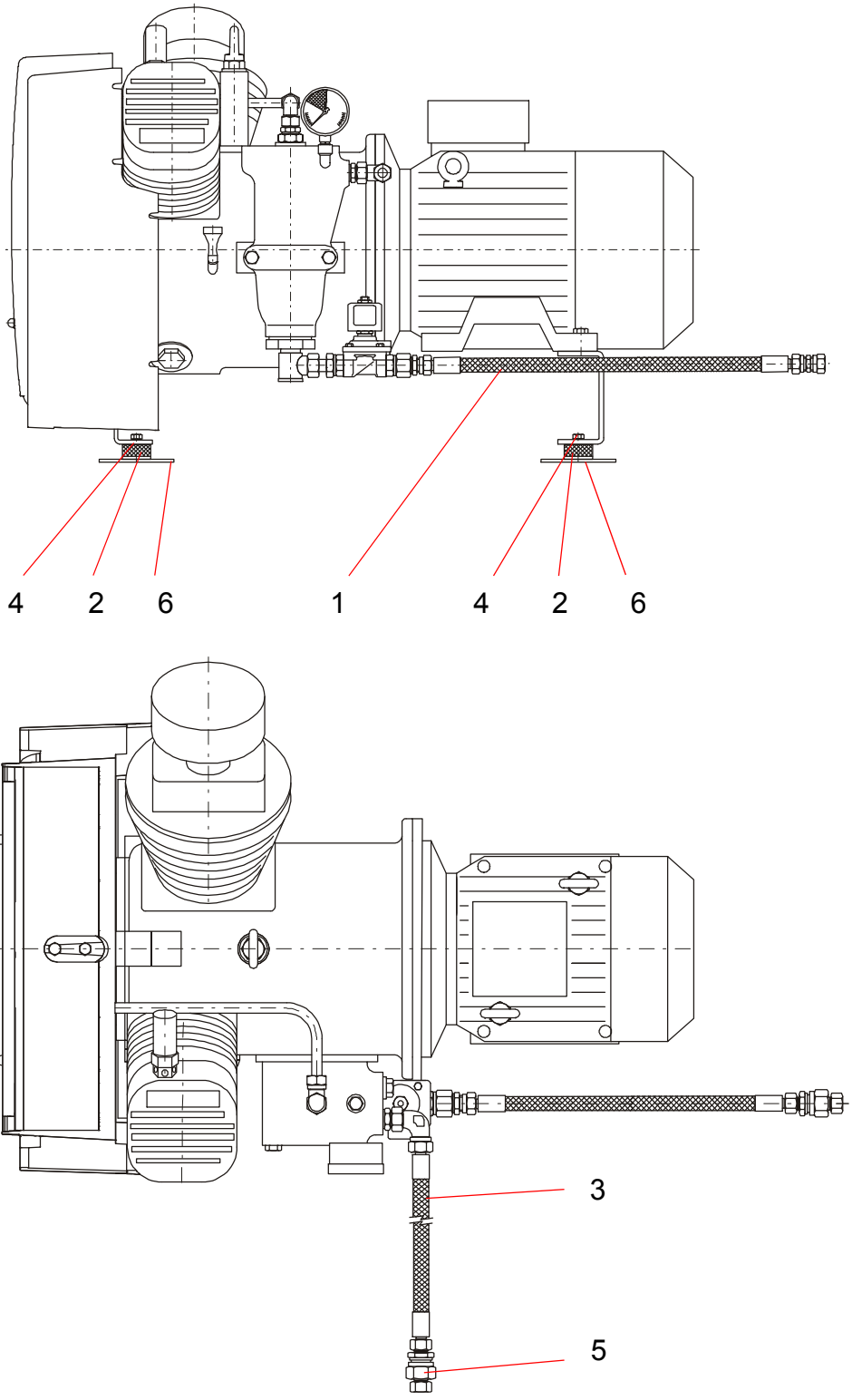
060 354 Automatic drainage system

Item No.	Ref. No.	Designation	Quantity
1[1)]	037 680[2)]	Solenoid valve	1
3	006 455	Stub	1
4	006 381	Reducing union	1
5	004 635	Fitting	1

1) Specify voltage and frequency for order!
2) The order number for the solenoid valve is order-specific.

065 568 Anti-vibration resilient mount



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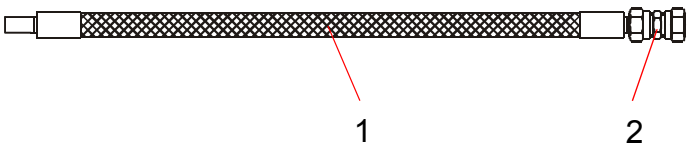
065 568 Anti-vibration resilient mount

Item No.	Ref. No.	Designation	Quantity
1	061 001	Hose line	1
2	035 457	Anti-vibration resilient mount	3
3	038 310	High pressure hose	1
4	002 031	Hexagon nut	3
5	011 130	Non-return valve	1
6	038 197	Mounting plate	3

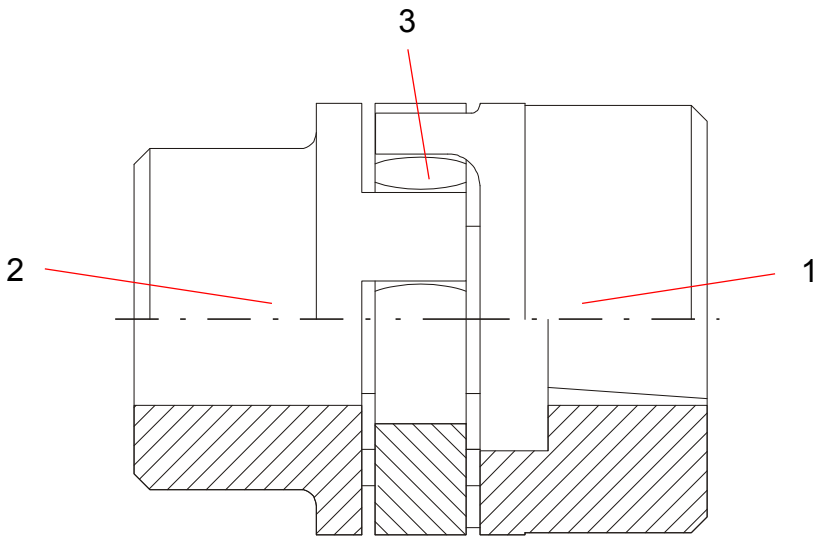
061 001 Hose line



061 001 Hose line

Item No.	Ref. No.	Designation	Quantity
1	038 309	High pressure hose	1
2	004 694	Fitting	1

Flexible coupling



Flexible coupling

Item No.	Ref. No.	Designation	Quantity
1 [1)]	035 316	Compressor half coupling	1
2 [2)]	035 318	Motor half coupling	1
3 [3)]	033 637	Coupling flexible insert	1

[1)] Item 1, Compressor half coupling 035 316 is part of assembly 060 315.
[2)] Item 2, Motor half coupling 035 318 is part of assembly 065 567.
[3)] Item 3, Coupling flexible insert 033 637 is part of assembly 065 567.

Parts List by Ref. No.

Ref. No.	Designation	Assembly	Page E -	Item
004 635	Fitting	060 354	36	5
004 647	Fitting	060 322	28	11
004 694	Fitting	061 001	40	2
004 750	Hexagon head screw	060 440	32	9
004 993	Fitting	060 322	28	10
005 001	Washer	060 328	30	6
005 006	Washer	060 322	28	15
005 006	Washer	060 440	32	6
005 009	Washer	060 312	34	8
005 009	Washer	060 322	28	14
005 023	Washer	060 312	34	7
005 029	Washer	060 312	34	6
005 029	Washer	060 316	10	21
005 247	Hexagon head screw	060 316	10	15
006 183	Fitting	060 322	28	13
006 187	Fitting	060 440	32	5
006 205	Fitting	060 328	30	5
006 212	Fitting	060 440	32	4
006 219	Fitting	060 322	28	12
006 381	Reducing union	060 354	36	4
006 390	Reducing union	060 312	34	4
006 455	Stub	060 354	36	3
008 646	Pipe	060 328	30	2
011 130	Non-return valve	065 568	38	5
012 728	Hexagon head screw	060 322	28	9
012 851	Hexagon head screw	065 567	4	18
030 113	Air filter	068 628	24	3
030 752	Safety valve 2nd stage	060 315	6	17
030 915	Safety valve 1st stage	060 315	7	16

Ref. No.	Designation	Assembly	Page E -	Item
038 310	High pressure hose	065 568	38	3
039 029	Needle sleeve	060 283	18	4
039 029	Needle sleeve	060 319	22	7
050 459	Connecting rod bolt	060 280	16	6
050 459	Connecting rod bolt	060 283	18	6
050 510	Fan wheel/flywheel	060 317	14	2
050 519	Gudgeon pin bush	060 280	16	4
050 520	Connecting rod bearing	060 280	16	5
050 520	Connecting rod bearing	060 283	18	5
050 545	Cooler 1st stage	060 322	28	1
050 547	Clamp	060 322	28	3
050 548	Clamp	060 322	28	4
050 549	Clamp	060 322	28	5
050 585	Gudgeon pin	060 283	18	7
050 585	Gudgeon pin	060 319	22	2
050 643	Nameplate	060 315	6	19
054 816	Stud bolt	060 316	10	2
054 817	Stud bolt	060 316	10	3
060 264	Gasket	068 615	26	3
060 266	Gasket	068 628	24	4
060 267	Cylinder head	068 615	26	2
060 274	Connecting rod	060 280	16	1
060 277	Connecting rod	060 283	18	1
060 280	Connecting rod 1st stage	060 315	7	3
060 283	Connecting rod 2nd stage	060 315	7	4
060 300	Cylinder head	068 628	24	2
060 302	Cylinder	068 615	26	1
060 304	Cylinder	068 628	24	1
060 311	Separator housing	060 312	34	1